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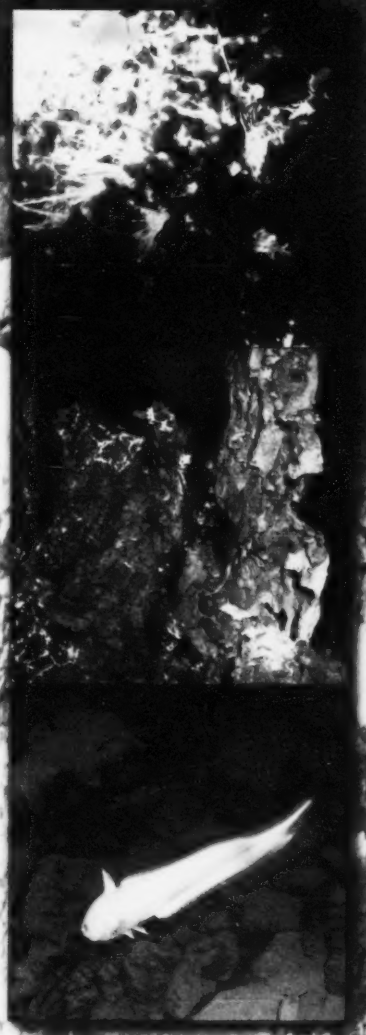

Endeavour Hydrothermal Vents

Marine Protected Area MANAGEMENT PLAN

2010-2015

Canada

ACKNOWLEDGEMENTS

The Oceans, Habitat and Enhancement Branch of Fisheries and Oceans Canada (DFO) Pacific Region prepared this report with assistance from and review by Endeavour Hydrothermal Vents Area Technical Advisory Committee. Other sectors within DFO and third-party contractors also contributed to the writing and review of this management plan.

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Canadian Coast Guard

Canadian Scientific Submersible Facility

Published by:

Fisheries and Oceans Canada | Pêches et Océans Canada

Oceans, Habitat and Species at Risk
Oceans Sector
Vancouver, BC V6C 3S4
E-mail: ehvmpa@pac.dfo-mpo.gc.ca

DFO/2009-1550

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Cat.No. Fs23-538/2009E
ISBN: 978-1-100-11610-5

Cette publication est aussi disponible en français.

EXECUTIVE SUMMARY

The Endeavour area of the Juan de Fuca Ridge is a seismically active area of seafloor formation and hydrothermal venting. The Endeavour Hydrothermal Vent area is located 250 km offshore from Vancouver Island, 2250 m below the ocean's surface. The area has been a popular research site for more than 20 years. Scientists come to study unique biota, venting processes and chemistry, as well as seismic and magmatic activity. An organism from this site holds the current record for the upper temperature limit to life: 121°C. Researchers strive to uncover secrets of the formation of Earth's tectonic plates and chemosynthetic food webs. They also seek a potential glimpse of the origins of life on our planet, and perhaps its origins on others.

On March 4, 2003, the Endeavour Hydrothermal Vent Marine Protected Area (EHV MPA) was officially designated under Canada's *Oceans Act*. Endeavour fulfills criteria for Marine Protected Area (MPA) establishment as identified in the *Oceans Act*, such as conservation and protection of unique habitats and marine areas of high biodiversity and productivity. The designation followed a consultative process that included DFO staff, scientists, managers, environmental

organisations and educators. DFO and the Technical Advisory Committee (TAC) collaborated in the development of the designation, a management framework and this management plan. This plan includes input from consultations, Regulations and the Regulatory Impact Analysis Statement (RIAS) for EHV MPA.

The EHV MPA Regulations legally designate the EHV as an MPA and establish its boundaries, prohibitions and exceptions. The general prohibitions, with exceptions, state that no person shall:

- *disturb, damage or destroy, or remove from the Area, any part of the seabed, including a venting structure, or any part of the subsoil, or any living marine organism or any part of its habitat.*
- *carry out any underwater activity in the Area that is likely to result in the disturbance, damage, destruction or removal of any part of the seabed, including a venting structure, or any part of the subsoil, or any living marine organism or any part of its habitat.*

The objectives for the EHV MPA build on the criteria for MPA establishment identified in the *Oceans Act*, the EHV MPA Regulations and the RIAS. The RIAS for EHV MPA states: "The designation of the Endeavour Hydrothermal Vents as a Marine Protected Area will provide for the long-term protection of this biologically diverse and productive ecosystem". With guidance from these documents and advice from the TAC, the objectives for the EHV MPA were further refined to provide direction for the management plan.

The conservation objective for the EHV MPA is:

- *Ensure that human activities contribute to the conservation, protection and understanding of the natural diversity, productivity and dynamism of the ecosystem and are managed appropriately such that the impacts remain less significant than natural perturbations (e.g. magmatic, volcanic or seismic).*

The management objectives of the EHV MPA are:

- *Coordinate human activities to ensure responsible procedures are followed (e.g. sampling, instrument deployment and retrieval, data sharing, appropriate debris disposal).*
- *Contribute to public awareness of the values of marine ecosystems and the need to protect them.*

To achieve the objectives, a suite of management measures has been developed. These measures range from broad overarching tools, such as the vessel access review process developed to provide a consistent and inclusive method of effectively evaluating all proposed research activity within the MPA, to more focused tools such as mitigation measures to minimise impacts of specific activities. For the five years targeted by this management plan, the priority activities associated with these management measures are:

1. applying Research Vessel Clearance Request Process consistently;
2. improving EHV MPA mapping accuracy;
3. identifying knowledge gaps;
4. obtaining results arising from research activities as appropriate;
5. improving timeliness of post-cruise reporting;
6. applying the Management Support System effectively to encourage sample/data sharing; and
7. monitoring management plan effectiveness and developing ecological monitoring plan.

DFO has primary responsibility for the protection and management of the EHV MPA. The TAC has been instrumental in MPA assessment, in the development of the interim and the current management plans, and in the development of objectives and management measures. The TAC continues to provide advice and recommendations to DFO on the conservation and management of EHV MPA, including providing necessary input for the evaluation of proposed activities in the EHV MPA, as well as the evaluation of the management plan itself.

The management plan will be reviewed every five years, or as deemed necessary by DFO and the TAC. The current version of the management plan is intended to guide management of EHV MPA from 2010 to 2015. DFO and the TAC will work together to review and update priority activities as they relate to the objectives for EHV MPA as new information is obtained.

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INTRODUCTION

On March 4, 2003, Endeavour Hydrothermal Vents was designated as Canada's first Marine Protected Area (EHV MPA) under the *Oceans Act* (Appendix 1). This designation represents an important step in the protection of a unique, biologically diverse and productive hydrothermal vent ecosystem. The use of protected areas in the marine environment is growing around the world as governments have increasingly come to appreciate their value as a precautionary and proactive means of conserving important ecosystems.

Located at a depth of 2250 m, 250 km offshore from Vancouver Island, British Columbia, Canada (Appendix 2), the Endeavour Segment is a seismically active hydrothermal venting system concentrated within a 1-km-wide rift valley about 20 km long. As a dynamic site of volcanic and tectonic activity, the area exhibits extreme physical, chemical, biological and geological features that are characteristic of hydrothermal vent areas, but quite unlike the surrounding barren seafloor. Despite, and in part because of such volatility, Endeavour is host to a thriving and diverse ecosystem based upon a microbial community deriving energy from chemicals dissolved within geothermally superheated plumes of water. As a consequence of its location offshore and its special ecosystem, scientific researchers are categorically the primary user group. However, Endeavour naturally captivates both researchers and the general public.

DFO has primary responsibility for the protection and management of the EHV MPA. DFO has collaborated with the Endeavour Hydrothermal Vent MPA Technical Advisory Committee (TAC) in the assessment of the Endeavour area, the designation of EHV MPA and the development of interim and current management plans as well as objectives and management measures. The TAC suggested that designation of the EHV MPA would be a valuable contribution to the protection and conservation of a portion of the Endeavour Segment of the Juan de Fuca Ridge that is characteristic of its dynamic submarine ecosystems, unusual hydrothermal features, specialised biota and habitats, high biodiversity and enhanced biological productivity. The work towards conservation, protection and promoting awareness of the EHV MPA ecosystem continues to honour the collaborative work of the EHV MPA Technical Advisory Committee (TAC) and DFO.

Box 1: Abbreviations for Frequently Used Terms

AOI	Area of Interest
CEAA	Canadian Environmental Assessment Act
CCG	Canadian Coast Guard
CCGS	Canadian Coast Guard Ship
CHS	Canadian Hydrographic Service
CS	Chief Scientist
DFAIT	Department of Foreign Affairs and International Trade
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
EEZ	Exclusive Economic Zone
EHV	Endeavour Hydrothermal Vents
ENGO	Environmental Non-Government Organisations
FAM	Fisheries and Aquaculture Management
MARPAC	Maritime Forces Pacific (DND)
MEQ	Marine Environmental Quality
MPA	Marine Protected Area
MSS	Management Support System
OHEB	Oceans, Habitat, and Enhancement Branch
SARA	Species at Risk Act
TAC	Technical Advisory Committee

Purpose and Scope of the Plan

The EHV MPA management plan establishes the management regime for the EHV MPA. The plan has been developed to support MPA Regulations and to provide guidance to DFO, other regulators, marine users and the public on achieving conservation objectives and protecting and managing the EHV MPA. This plan will serve as the long-term framework upon which

more detailed or additional operational plans for the MPA can be developed to address specific issues.

This plan is not static; it acknowledges that management measures that are possible today based on limited scientific data on the EHV ecosystem may need to be revised and enhanced in the future as we gain a better understanding of the ecosystem and the impacts of human activities. The following sections provide:

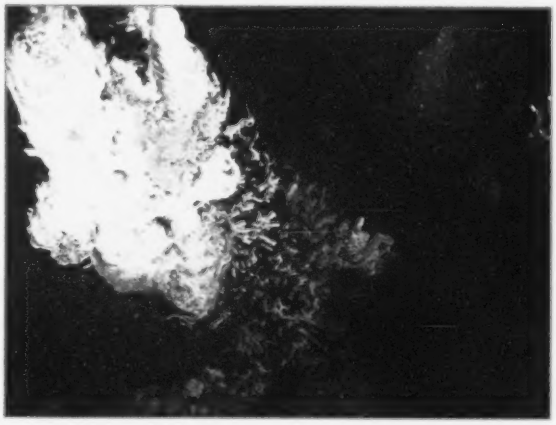
1. the legislative basis for designation of the EHV MPA;
2. an overview of the history, ecology and social/cultural aspects of the EHV MPA;
3. an outline of the management framework, including objectives, management measures and priority activities;
4. the governance structure that will be used to manage the EHV MPA;
5. enforcement and compliance issues;
6. strategies for education and outreach, as well as research and monitoring; and
7. a timeline and process for management plan review.

Legislation and Regulations

Canada's *Oceans Act*, under section 35, establishes the legislative basis for the designation of this MPA (R.S., 1996, c. 31) and defines several criteria for which an area may be designated a MPA. The criteria for designation relevant to Endeavour include the conservation and protection of unique habitats, marine areas of high biodiversity or biological productivity, or any other marine resource as is necessary to fulfil the mandate of the Minister of Fisheries and Oceans.

The EHV MPA Regulations came into effect March 4, 2003. The Regulations legally designate the Endeavour Hydrothermal Vents as a MPA and establish its boundaries (Appendix 1). The Regulations provide the framework for managing the MPA, by establishing prohibited activities, exceptions to prohibited activities and the requirement to submit research or cruise plans for activities within the MPA.

The Regulatory Impact Analysis Statement (RIAS) provides supporting information for the EHV MPA Regulations, including background to the Regulations, intent behind Regulations



and further details. This management plan is guided by this legislative and Regulatory context, and forms a framework to put the legislation and Regulations into practice.

Boundary

Regulations designating the EHV MPA (Appendix 1) describe the boundaries as "The area of the Pacific Ocean — the seabed, the subsoil and the waters superjacent to the seabed — that is bounded by a line drawn from a point at 47°54′N, 129°02′W, from there west to a point at 47°54′N, 129°08′W, from there north to a point at 48°01′N, 129°08′W, from there east to a point at 48°01′N, 129°02′W, and from there south to the point of beginning. The EHV MPA is approximately 100 km^2 located about 250 km southwest of Vancouver Island at a depth of 2250 m.

Prohibitions

There are general prohibitions for the EHV MPA with specified exceptions. The Regulations

prohibit any person from carrying out activities that may:

- disturb, damage or destroy, or remove from the Area, any part of the seabed, including a venting structure, or any part of the subsoil, or any living marine organism or any part of its habitat.
- result in the disturbance, damage, destruction or removal of any part of the seabed, including a venting structure, or any part of the subsoil, or any living marine organism or any part of its habitat.

Exceptions

Scientific research for the conservation, protection and understanding of the Endeavour Hydrothermal Vents MPA will be allowed provided that a research plan, conforming to the requirements set out in the EHV MPA Regulations (Appendix 1), is submitted at least 90 days before the start of research in the area, and all applicable licences, authorisations or consents required under the *Oceans Act*, *Coastal Fisheries Protection Act*, *Coasting Trade Act or Fisheries Act*, have been obtained.

Further exceptions to the prohibition include other activities authorised or licensed under the *Fisheries Act*, *Coasting Trade Act*, *Oceans Act*, or *Coastal Fisheries Protection Act*.

Activities of ships or submarines carried out for the purposes of public safety, law enforcement or Canadian sovereignty or national security are also exempt.

Issuance of fines

Violations of the MPA Regulations carry penalties under the *Oceans Act*, while contraventions of licences and consent issued for foreign vessel access can result in charges under the *Fisheries Act* and under the *Coasting Trade Act*. Upon conviction, the courts may impose fines and prison terms for offences under each of these Acts.

Linkages With Other Legislation

Although the EHV MPA Regulations provide the primary tool for protecting the MPA, activities within the MPA are also subject to provisions from other legislation, including:

- *Fisheries Act* (R.S., 1985, c.F-14);
- *Fisheries [General] Regulations* (SOR 98/481);
- *Coasting Trade Act* (R.S., 1992, c. 31);
- *Coastal Fisheries Protection Act*,(R.S., 1985, c. C-33); and
- *Species at Risk Act* (R.S., 2002, c. 29)

BACKGROUND

General Geographical Location and MPA Boundaries

Endeavour Hydrothermal Vents MPA is located on the Endeavour Segment of the Juan de Fuca Ridge. The EHV MPA Regulations (Appendix 1) define the boundary of the MPA while its management areas are established in this management plan. The area of the EHV MPA is 100 km^2 (Appendix 2).

Four management areas, corresponding to the principal vent fields within the MPA, were mapped in 1991 and again in 2005 with higher resolution using the autonomous underwater vehicle ABE. The main vent fields at Endeavour are, from south to north: Mothra, Main Endeavour, High Rise and Salty Dawg. In addition to these four identified management areas, the Sasquatch field was discovered in 2000. There are also minor fields including Clam Bed and Québec. Within the fields there are vent complexes (e.g. The Faulty Towers complex in Mothra); and within these complexes

there are individual chimneys that host numerous sites of venting (e.g. Giraffe, Roane and Finn).

History of the EHV MPA

In December 1998 the Minister of Fisheries and Oceans announced Endeavour Hydrothermal Vents as a pilot, or Area of Interest to consider for MPA designation under the *Oceans Act*, section 35(1). Planning and Advisory Teams were established shortly after the identification of Endeavour as an AOI in September 1999. The Planning Team included representation from federal departments, academic institutions and potential mining interests. The role of the Planning Team was to provide input towards the action plan and consultation framework for EHV MPA project. The Advisory Team, which included representation from federal departments, academic institutions and the teaching community, provided support to the Planning Team when required. Over the course of eight months, these teams developed the recommendations for the designation of EHV as a MPA. The majority of stakeholder consultation occurred within meetings of the Planning and Advisory Teams. In addition, these teams integrated the results from any consultation that occurred outside of their meetings into the recommendations for designation.

Due to the geographic distribution of stakeholders and the international importance of the EHV Area, various consultation initiatives ranging from workshops through to bilateral discussions were employed during the process. Groups and organisations consulted included academic institutions, museums, oceanographic groups, mining interests and environmental non-government organisation (ENGO) representatives. On two occasions, presentations were made to the Central Region Board on Vancouver Island regarding the proposed EHV MPA. The Central Region Board consisted of all Nuu-chah-nulth First Nations Chiefs and local and regional government representatives. The Central Region Board expressed great interest in the MPA project but no objections or concerns were expressed. Stakeholders and other government agencies and departments were generally supportive of designating Endeavour as a MPA, provided that management objectives encourage accountable research and are adaptive to changing levels of knowledge of the area.

In April 2000 a draft management plan was developed based on the recommendations arising from Planning Team meetings and stakeholder consultations. The plan was made available in June 2001. Endeavour Hydrothermal Vents was officially designated an MPA in 2003. As an interim management measure, DFO implemented the management plan by vetting all Foreign Vessel Clearance Requests for EHV with the Planning and Advisory Teams.

The Advisory Team's composition evolved to include additional scientists, government and ENGO representatives, and it has continued to be involved since the 2003 designation. A workshop was held in Vancouver, BC in 2005 to further develop the Operational Plan, a precursor to this current management plan for EHV MPA, through the exchange of information between the Advisory Team and other scientists and government representatives. The results of the workshop and the Operational Plan have been incorporated into this management plan. DFO recognises the effort and commitment demonstrated by the Planning and Advisory Teams. This management plan maintains the role of the Advisory Team to provide continuity of direction from pre-designation through to management of the MPA.

Summary of Ecosystem Overview

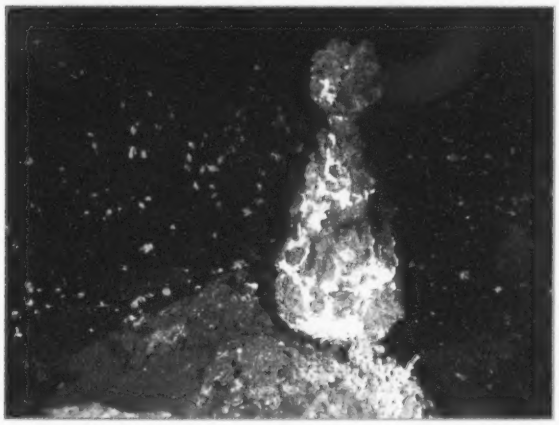
During the AOI identification process a Background Report (Tunnicliffe and Thomson, 1999) and an Ecosystem Overview were prepared. They describe the ecological, economic and social characteristics of the Endeavour area in greater detail. These documents can be found at the Endeavour website: (http://www.pac.dfo-mpo.gc.ca/oceans/mpa/info_e.htm).

Ecological Characteristics

As part of the Juan de Fuca Ridge system, the Endeavour Segment is an active seafloor-spreading zone where tectonic plates diverge and new oceanic crust is extruded onto the seafloor through volcanism. The Endeavour Segment is one of the larger seafloor hydrothermal zones currently known. In these zones, cold seawater percolates downward through the crust where it is heated by the underlying magma and hot rock, eventually emerging through the seafloor as buoyant plumes of mineral and metal-rich, superheated fluid that reaches temperatures of 380°C. The five known vent fields on Endeavour Segment are separated along the ridge from one another by about two kilometres (Figure 1).

Figure 1. Bathymetric map of the locations of the five main hydrothermal vent fields and smaller sites of diffuse flow. D. Kelley and J. Delaney, University of Washington.

In the case of the major Mothra, Main and High Rise fields, associated plumes rise rapidly about 300 metres into the overlying water column. The fields span a wide range of hydrothermal venting conditions characterised by different water temperatures, fluid chemistry, sulphide structure morphologies and animal abundance (Box 2). Hydrothermal vents in the Endeavour area consist of large, hot black smoker, chimney-like structures with vigorous venting, and proximal lower temperature sites that host diffuse flow. Some of Earth's highest natural water temperatures and most extreme temperature gradients exist in the hydrothermal venting fields. Temperatures associated with black smokers are commonly in excess of 300°C. Formation of the large polymetallic sulphide chimneys takes place when dissolved minerals carried upward by the smokers precipitate upon mixing with the 2° C surrounding seawater. Cooler waters with



temperatures below about 115° C that issue from the seafloor and along the flanks of the chimneys support an abundance of flora and fauna.

Habitat is provided by the venting chimney surfaces, porous chimney walls and vent plumes, as well as by macrofauna (e.g. tubeworms and

Box 2: Characteristics of the five principal vent fields (Delaney, 1988; Kelley et al., 2001)

Area	Geology	Venting Character	Found
Main Endeavour	Near the Western Wall Axial Valley 400 m long, 150 m wide 20 massive sulphide structures 100 active vents; tallest 20-25m round-conical structures with flanges	Vigorous, temperatures to 380°C less than seawater chlorinity, highly perturbed by magmatic event in 2000	1982
Mothra	Base of Western Wall Axial Valley 600 m long 6 clusters of sulphide structures tallest 22 m slender conical pinnacles	Moderate, temperature to 300°C diffuse through chimney walls; high chlorinity	1984
High Rise	Northern sector of the Axial Valley 400 m by 400m; 10 large, tall structures: tallest ~30 m 45 m chimney fell over in 1996	Vigorous, temperature to 330°C diffuse venting through tube worm clusters, flange surfaces within 20% seawater chlorinity	1988
Salty Dawg	Near the eastern Axial Valley wall several hundred square m; 30 small structures; tallest 25m	Weak, diffuse, temperature to 320°C high chlorinity	1988
Sasquatch	Northernmost vent field ~25 x 25m, ~10, 1-6m high, fragile sulfide chimneys	Chimneys vent fluids up to 289°C	2000

clam beds). The ecosystem dependent on the hot vents is extreme; based on the derivation of energy from the chemical compounds in the vent plumes, specifically hydrogen sulphide, carbon dioxide and methane (Box 3).

Social and Cultural Characteristics

SCIENTIFIC RESEARCH

The Endeavour Segment of the Juan de Fuca ridge is one of the most scientifically interesting and extensively studied venting regions in the ocean. The unique characteristics of the EHV area attract scientific researchers from around the globe. Attributes that make EHV suitable for research include the high density of hydrothermal vents and easily accessible gradients in temperature, salinity, and redox potential on segment, vent field and sulfide structure scales, all within a 10-km span, and in relative proximity to ports.

Since its discovery in 1982, the EHV Area has been a focus of research by Canadian and international scientists. Many disciplines are represented, including geology, seismology, biology, physical oceanography, chemistry, hydrology and biotechnology. The area also draws interest from researchers studying evolutionary theory, and outer space explorers looking for secrets of the origins of life on Earth and on other planets.

Themes of scientific interest include short- and long-term changes in biota and water properties near the vents, water properties within the vent plume and characteristics of the productively enhanced water column and hydrothermal circulation above the EHV area. Some research activities rely directly on sampling while others are more observational and modelling-based.

To date, a wide variety of instruments have been deployed and samples collected. Vehicles, including manned and unmanned submersibles, have been used for research from Canadian

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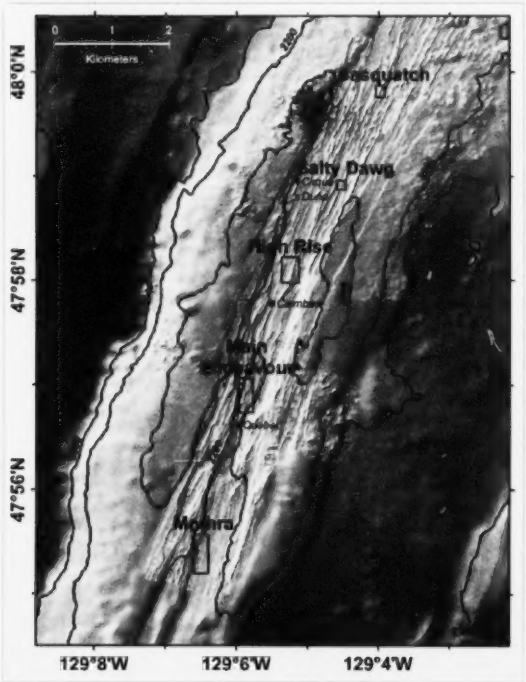

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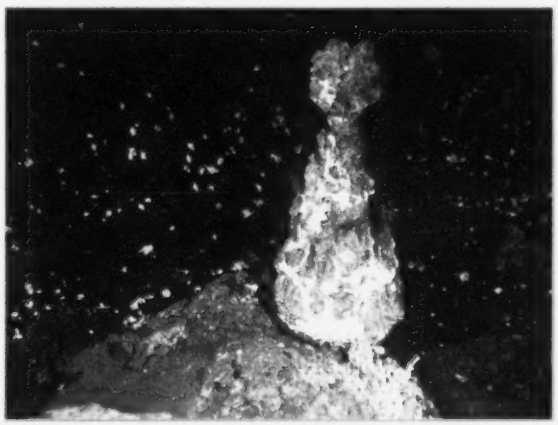

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Box 3: Hydrothermal vents: extreme environment, unique organisms.

While hydrogen sulphide is toxic to most life, organisms in the vent areas have adapted uniquely to not only cope with these compounds in high concentrations, but harness the energy contained within them. Microbial life thrives inside the mineral-laden plumes, vent chimneys and even within invertebrates in a symbiotic relationship. The significant productivity in the lower trophic levels supports zooplankton populations and attracts mobile invertebrates and vertebrates from the surrounding environment; creating an oasis of biological productivity. A variety of benthic organisms such as crabs, octopi, brittlestars, fish (e.g. skates and grenadiers), tubeworms, and bivalves are found in the EHV area. Similarly, in the water column, organisms such as fish, jellyfish, amphipods, and others depend upon the plume-generated biological productivity. A Bestiary of organisms found at EHV has been compiled (Tunnicliffe,1999), and is available on the Endeavour website: (http://www.pac.dfo-mpo.gc.ca/oceans/mpa/info_e.htm)

Despite the diversity supported by this environment, its conditions do create significant challenges; hence the term "extremophiles" is applied to organisms living in the most toxic areas. The organisms that are able to thrive are specialised for these conditions, and are often not found in other environments. More than 90 percent of the animals found in the Endeavour area are endemic to vents. There are some 60 distinct species native to the Juan de Fuca Ridge. Many of these species are the first in the world to be identified. Hydrothermal vents at Endeavour are home to at least 12 species that are not known to exist anywhere else in the world.

Coast Guard (CCG) and foreign vessel platforms. Acoustic and moored instrument programs have operated in the area since 1985. Sediment sampling, current meter time series and chimney specimens have been collected. Each season, one or more submersible trips occur as part of expeditions of several days to one-month duration. These will likely increase as the NEPTUNE project proceeds.

Three of the five main vent fields (Main, Mothra and Sasquatch) have been studied more than the remaining two (High Rise and Salty Dawg).

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VESSEL TRAFFIC

The main directed surface traffic in the area consists of research vessels. Incidental traffic in the area can occur as a result of commercial fishing, naval and commercial shipping activities. This traffic is presumed not to pose a threat to the Endeavour ecosystem.

Box 4: Key Organisations and Research at Endeavour Hydrothermal Vents MPA

NEPTUNE Canada (www.neptunecanada.com)
An environmental assessment of deep sea construction on Endeavour was conducted and steps taken to ensure minimal impact.

In 2008, an 800-km ring of cable was installed on the seafloor in the northern portion of the Juan de Fuca Plate. This fibre-optic network provides interaction and education opportunities for scientists and the general public by streaming data on demand from instruments to the web.

One of five instrumentation "nodes" to be installed in 2008 will be placed in EHV, facilitating increased observation and experimentation in the area.

Ridge 2000 (www.ridge2000.org)
Multidisciplinary initiative to study oceanic spreading, hydrothermal flow and biological processes as an integrated whole.

Activities include water sampling, biological and rock sampling, photography and in situ sensor deployment. The Endeavour is one of three global Ridge study sites.

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International collaboration to promote coordinated interdisciplinary study, communication and education and encourage the protection and management of the ocean ridge and spreading centres.

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CanRidge is Canada's representative organisation on InterRidge. CanRidge scientists have been researching the EHV site, and others, for more than 20 years.

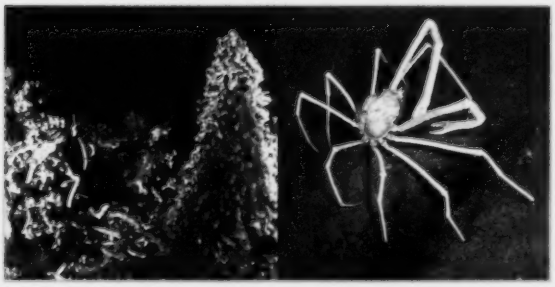
MINERALS

Some mining companies are interested in the prospects of extracting non-renewable resources from deep-sea hydrothermal vent field areas in the form of polymetallic sulphides, which can contain commercially valuable concentrations of the metals copper, zinc, silver and gold. Mineral extraction is prohibited within the MPA under the Regulations. A review of mining potential in the area (Scott, 2001) concluded that no commercially valuable deposits were excluded by MPA designation, as estimates of mineral tonnage in the area were insignificant and would not justify the cost of exploration and extraction.

COMMERCIAL FISHING

The Endeavour area is known to support numerous fish species near the ocean floor and through the water column, including the hydrothermal plumes that reach up to a few hundred metres above the vent fields. The vent plumes are also known to enhance productivity virtually up to the sea surface, though these ecosystem interactions are not yet fully understood.

In the area of the Endeavour vent fields there is occasional commercial fishing for tuna and neon flying squid, highly transient species. Pelagic fishing is not considered to be in conflict with the objectives of the MPA. Any licensed fishing in the MPA takes place very near the ocean surface and will continue as it does not significantly impact the hydrothermal vents ecosystem.



MANAGEMENT FRAMEWORK

MPA Objectives and Principles

The objectives for the EHV MPA are based on direction from the *Oceans Act* purposes for designating MPAs, the EHV MPA Regulations, and advice provided through consultations with respect to expectations for the EHV MPA. The resultant conservation and management objectives provide guidance for the effective implementation of the Regulations and will assist in management of activities within the MPA.

Conservation objectives

To ensure that the MPA Regulations and management measures are effective, there must be a standard against which they can be evaluated. The conservation objective, developed by DFO in collaboration with the TAC, provides that standard.[1]

The conservation objective of the EHV MPA is:

- Ensure that human activities contribute to the conservation, protection and understanding of the natural diversity, productivity and dynamism of the ecosystem and are managed appropriately such that the impacts remain less significant than natural perturbations (e.g. magmatic, volcanic or seismic).

Management objectives

Management principles and objectives identify priorities for management that support the achievement of the above conservation objective.

[1] Conservation objectives are statements, expressed in broad terms, which describe aspirations for the ecological feature(s) of the MPA.

Box 3: Hydrothermal vents: extreme environment, unique organisms.

While hydrogen sulphide is toxic to most life, organisms in the vent areas have adapted uniquely to not only cope with these compounds in high concentrations, but harness the energy contained within them. Microbial life thrives inside the mineral-laden plumes, vent chimneys and even within invertebrates in a symbiotic relationship. The significant productivity in the lower trophic levels supports zooplankton populations and attracts mobile invertebrates and vertebrates from the surrounding environment; creating an oasis of biological productivity. A variety of benthic organisms such as crabs, octopi, brittlestars, fish (e.g. skates and grenadiers), tubeworms, and bivalves are found in the EHV area. Similarly, in the water column, organisms such as fish, jellyfish, amphipods, and others depend upon the plume-generated biological productivity. A Bestiary of organisms found at EHV has been compiled (Tunnicliffe,1999), and is available on the Endeavour website: (http://www.pac.dfo-mpo.gc.ca/oceans/mpa/info_e.htm)

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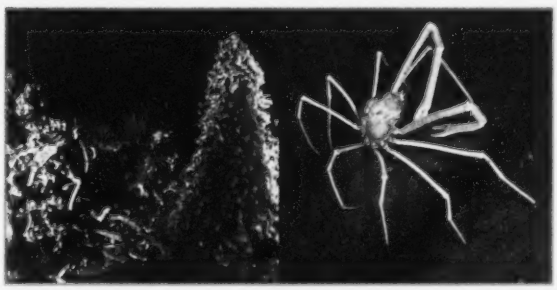

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Management objectives

Management principles and objectives identify priorities for management that support the achievement of the above conservation objective.

[1] Conservation objectives are statements, expressed in broad terms, which describe aspirations for the ecological feature(s) of the MPA.

The management objectives of the EHV MPA are:

- Coordinate human activities to ensure responsible procedures are followed (e.g. sampling, instrument deployment and retrieval, data sharing and appropriate debris disposal).
- Contribute to public awareness of the values of marine ecosystems and the need to protect them.

Management Principles

Principles developed in Canada's National Policy and Operation Framework for Integrated Management and the *Oceans Act* were the basis for determining the development of principles for EHV MPA. Management principles particularly applicable to the EHV MPA were adopted for the draft management plan (2001) and are included in this plan (Box 5).

Box 5: Endeavour Hydrothermal Vents MPA Management Principles

WORKING TOGETHER

While DFO has jurisdictional responsibility, overlaps and limits to the department's authority make accountability an important issue. Co-operation and co-ordination among DFO, other government agencies, TAC member organisations and other stakeholders are essential to assure the shared accountability for the protection of the resource. Moreover, the goal and objectives for the EHV area can only be achieved in this manner. DFO will provide the leadership that fosters this co-ordination, co-operation and partnership, in an open, transparent and inclusive manner.

ECOSYSTEM-BASED APPROACH

An ecosystem-based approach will be used to manage the EHV MPA. An ecosystem approach to management recognizes that human activities must be managed in consideration of the interrelationships between organisms, their habitats and the physical environment based on the best available science. This approach focuses on the pertinent factors and drivers contributing to and affecting the biodiversity, productivity, water quality and habitat quality of the marine environment. A consequence of this approach could be that various users will have to consider the impact of their actions on other activities, or activities may need to be modified in such a way that the integrity of the ecosystem is maintained.

ADAPTIVE MANAGEMENT

Objectives for Ecosystem Based Management within the EHV MPA are subject to external influences and may change over time. Flexibility has been and will continue to be maintained in the management process to incorporate new information relevant to the management of EHV as it becomes available. This has been facilitated through the participation and co-operation of scientists from governments and academia. The Endeavour TAC is expected to provide ongoing feedback on the management plan and measures to meet EHV MPA objectives.

Management actions must be adaptive and responsive to changing knowledge, and changing social, environmental and economic conditions. The manager will consider the advice of the TAC and results from new research and will adapt activities where necessary on a continuous basis, particularly regarding the impacts of research activities. If issues arise over the next few years that require immediate adaptation of the plan, those changes will be made in consultation with the TAC and appended to the plan.

PRECAUTIONARY APPROACH

The precautionary approach, defined in the *Oceans Act* as "erring on the side of caution", is a key tool to be applied in the management of ocean activities. Under *Canada's Ocean Strategy*, the Government of Canada is re-affirming its commitment to promoting the wide application of the precautionary approach to the conservation, management and exploitation of marine resources in order to protect these resources and preserve the marine environment. Conservation actions are taken based on the best available science and applied in an ecosystem context.

Management Measures

Management measures are the practical tools and procedures to be used by DFO to achieve conservation and management objectives and help gauge the effectiveness of the MPA (Box 6).

Box 6: Overview of Management Measures

Management Measure	Role of the Management Measure	Goals for the Management Measure
Research Vessel Clearance Request Process	Monitor and manage access to the EHV MPA by foreign and domestic vessels. Ensure understanding of and compliance with the EHV MPA Regulations and objectives.	Apply consistent, comprehensive activity access review processes for domestic and foreign vessel clearance. Develop guidelines for applying to conduct research.
Research Activity Review Framework	Review proposals for work in EHV MPA with respect to management areas, potential impact and identify appropriate guidance.	Apply Research Activity Review Framework consistently.
Research Plans	Monitor activity and manage access in a precautionary way to obtain data for further understanding of the area. Ensure research is consistent with MPA objectives.	Develop detailed data gap analysis. Communicate guidance to encourage collection of information. Develop monitoring strategy.
Management Areas	Distinguish areas where activity impacts must be minimal. Facilitate responsible scientific exploration of areas open to research.	Improve accuracy of mapping. Finalise management aims for newly delineated vent fields.
Activity Guidance	Precautionary guidance to supplement management areas to ensure that disturbances to the ecosystem by scientific research are minimised.	Develop guidance for some potential stressors. Pathways of effects modelling to be considered.
Cruise reports	Ensure that cruise activities do not contravene the regulations of the MPA. Collect necessary ecosystem data to address identified knowledge gaps.	Obtain information through cruise reports, logbooks, geo-referenced video, data analysis, or voluntary data sharing arrangements with researchers. Improve timely follow-up through cruise plans / post-cruise reporting.
Codes of Conduct/ Guidelines	Provide specific guidance to scientists ensuring that scientific research meets the objectives of the MPA and follows best practices for research in marine environments, particularly hot vent fields.	Officially endorse InterRidge Code of Conduct. Draft guidance for scientific sampling to be developed and applied.
Management Support System	Develop a geo-referenced database and web mapping system for use in the management, monitoring, and coordination of human activities in the EHV MPA, in support of MPA objectives.	Use of database to enhance coordination of ship routes, sensor locations, samples, and bathymetry. Determine areas of duplicated effort and suggest scientists share data, photos, and video to reduce multiple sampling.

These management measures compliment and support each other within a nested system as shown (Box 7). The following is a brief explanation of how each measure relates to the others; a more detailed examination of each measure individually is provided in the sections below.

Box 7: Management Measures relationships

The Research Vessel Clearance Request Process forms the main gateway for contact with all researchers.

The Research Activity Review Framework is employed as a step within the Research Vessel Clearance Request Process.

The Management Support System (MSS) will be an overarching tool that informs the activity review process, and fulfills a key data coordination role.

As shown in Box 6, the list of goals for each available management measure is extensive thus for the five years guided by this management plan several priority goals have been identified. These priorities are described later as part of the management plan review (Box 10).

Research Vessel Clearance Request Process

The processes for reviewing proposals for vessel access to EHV MPA is the key management measure for ensuring that the Regulations and objectives of the MPA are addressed by the research activities of domestic and foreign scientists.

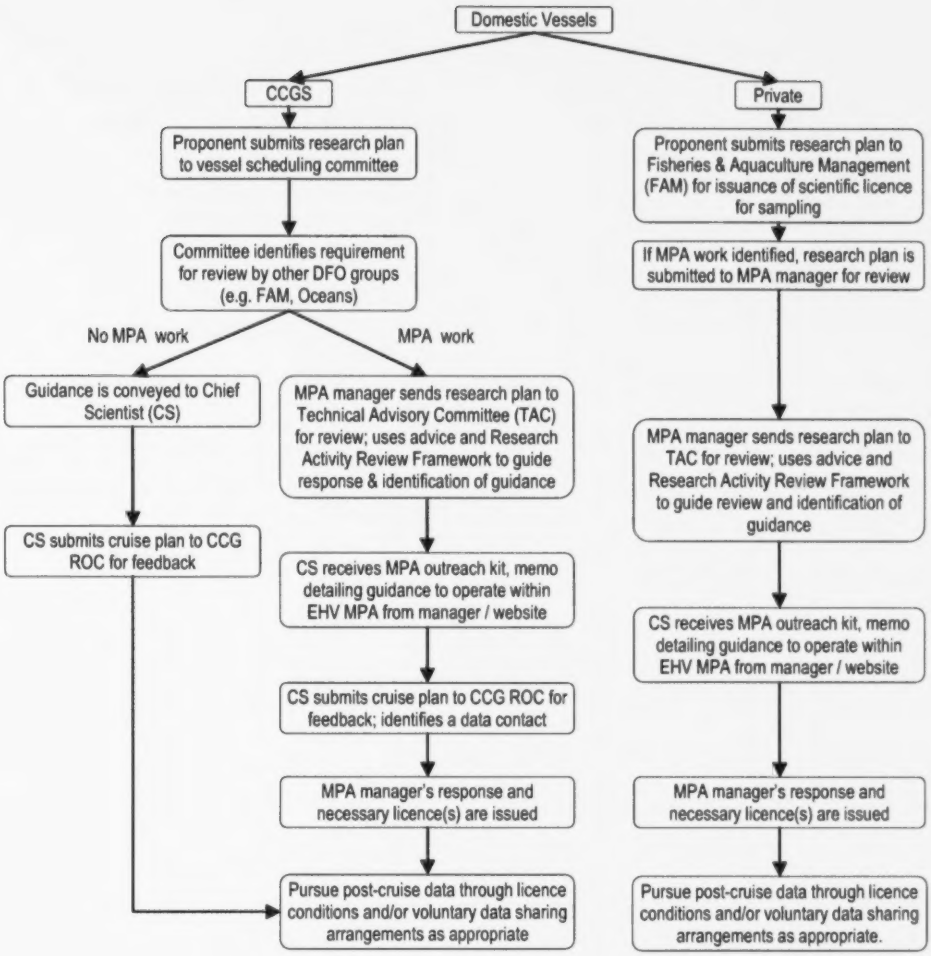

Domestic Vessels
CCGS
Private
Proponent submits research plan to vessel scheduling committee
Proponent submits research plan to Fisheries & Aquaculture Management (FAM) for issuance of scientific licence for sampling
Committee identifies requirement for review by other DFO groups (e.g. FAM, Oceans)
If MPA work identified, research plan is submitted to MPA manager for review
No MPA work
MPA work
Guidance is conveyed to Chief Scientist (CS)
MPA manager sends research plan to Technical Advisory Committee (TAC) for review; uses advice and Research Activity Review Framework to guide response & identification of guidance
MPA manager sends research plan to TAC for review; uses advice and Research Activity Review Framework to guide review and identification of guidance
CS submits cruise plan to CCG ROC for feedback
CS receives MPA outreach kit, memo detailing guidance to operate within EHV MPA from manager / website
CS receives MPA outreach kit, memo detailing guidance to operate within EHV MPA from manager / website
CS submits cruise plan to CCG ROC for feedback; identifies a data contact
MPA manager's response and necessary licence(s) are issued
MPA manager's response and necessary licence(s) are issued
Pursue post-cruise data through licence conditions and/or voluntary data sharing arrangements as appropriate
Pursue post-cruise data through licence conditions and/or voluntary data sharing arrangements as appropriate.

Figure 2. Domestic Research Vessel Clearance Request Process

In the EHV MPA, the main domestic vessels currently employed for research are Canadian Coast Guard Ships (CCGS). Therefore, vessel tasking processes under the CCG Vessel Planning Program through the Regional Operations Centre (ROC) are considered appropriate mechanisms for managing domestic access to the MPA. Through these processes, the EHV MPA Manager is apprised of proposed work in the MPA, can review the proposed research plan for consistency with MPA objectives, make contact with the Chief Scientist for clarification and provide advice and guidance for operation in the MPA to be included in research plan review (Figure 2).

At this time it is not expected that private domestic vessels would have the capacity to conduct research at EHV without CCG support. However, in the event that private domestic proponents do wish to conduct research at EHV in the future, a scientific licence would be required for any activity that involved sampling organisms. At the time of submission for scientific licence, the MPA manager would be informed of the request to work in the EHV MPA, and would be able to review the research plan and submit conditions to be applied to any scientific licence.

Foreign vessels are required to obtain permission to engage in ocean research activity in Canadian

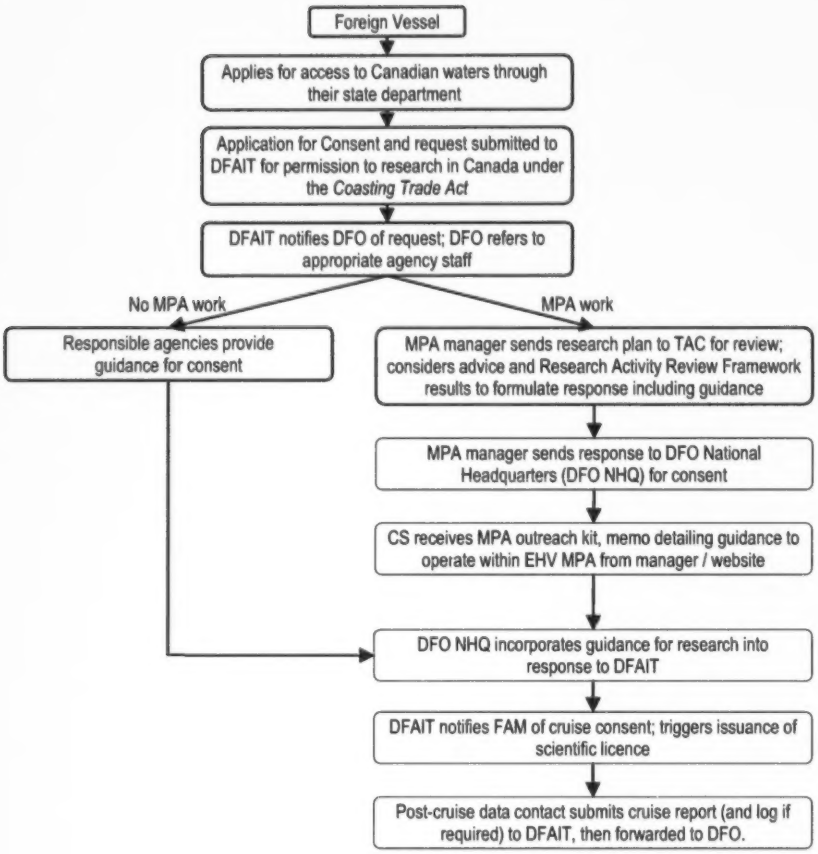
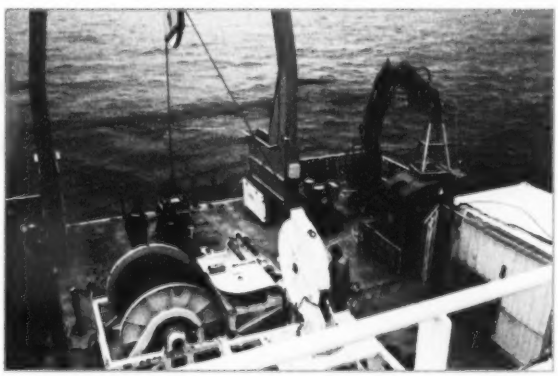

Foreign Vessel
Applies for access to Canadian waters through their state department
Application for Consent and request submitted to DFAIT for permission to research in Canada under the Coasting Trade Act
DFAIT notifies DFO of request; DFO refers to appropriate agency staff
No MPA work
MPA work
Responsible agencies provide guidance for consent
MPA manager sends research plan to TAC for review; considers advice and Research Activity Review Framework results to formulate response including guidance
MPA manager sends response to DFO National Headquarters (DFO NHQ) for consent
CS receives MPA outreach kit, memo detailing guidance to operate within EHV MPA from manager / website
DFO NHQ incorporates guidance for research into response to DFAIT
DFAIT notifies FAM of cruise consent; triggers issuance of scientific licence
Post-cruise data contact submits cruise report (and log if required) to DFAIT, then forwarded to DFO.

Figure 3. Foreign Research Vessel Clearance Request Process

waters through the Department of Foreign Affairs and International Trade (DFAIT) under the *Coasting Trade Act* (s. 3 (2) (c)). Requests submitted to DFAIT include the submission of an "Application for Consent to Conduct Marine Scientific Research in Areas under National Jurisdiction of Canada," identifying the type and location of proposed activities for review and authorisation. Requests from foreign vessels are routed through diplomatic channels to DFAIT through the Foreign Vessel Clearance Request (FVCR) Process (Figure 3).

Requests submitted for research activity in the EHV area are forwarded to the EHV MPA Manager, who reviews the requests for consistency with the management plan. Advice regarding the requests will also be sought from the EHV MPA TAC. If additional information is



required, it is requested through DFAIT for further clarification. After consideration of all relevant legal requirements, DFO's regional response provides advice to the Minister of Foreign Affairs and International Trade on guidance related to the consent. *Oceans Act* (R.S. 1996, c. 31), section 44, provides for

conditions and guidelines that DFO may request DFAIT place on the consent.

DEVELOPMENT OF GUIDELINES FOR APPLYING TO CONDUCT RESEARCH IN ENDEAVOUR MPA

To ensure consistency in the access review process and clarity for applicants, DFO will develop a guide and application form for both managers and prospective researchers on application requirements. This guide will build on the Regulations that identify the basic information requirements of research plan submission. Included in the guide will be a scientific research review form, similar to that shown in Appendix 7, to guide the review process, as well as logsheets and a description of information requirements corresponding to known information gaps. As a condition of scientific licence, accurate reporting of instrument deployment and measurements, sampling activities and locations of activity will be requested (see Cruise reports section below).

Research Activity Review Framework

The Draft Research Activity Review Framework lays out a decision tree to identify situations where disturbance, damage, destruction and removal may be consistent with the Regulations, as well as situations where it would not be acceptable (Canessa, 2005). The Research Activity Review Framework attempts to qualify and, where possible, quantify acceptable impacts and elaborate on special considerations. Using the best information available, this framework currently outlines qualitative indicators of acceptable and unacceptable impacts. The proposed Research Strategy will serve to outline a plan for ongoing improvement of our knowledge of EHV, leading to more quantitative stress and ecosystem indicators.

In addition to the vessel access review process the Research Activity Review Framework was developed to review proposed research activities in the context of the Management Area consistent with guidance from the management plan. The approach built on the work of the interim management guidelines developed in April 2000 and input received from the Stakeholder Advisory Team. The Framework is based on the premise that both a reasonable precautionary and adaptive approach should be followed such that the Framework can be refined and improved over time.

The Framework is divided into four components. The first component outlines the review assessment for activities within the MPA as a whole. The three components that follow in the Framework outline the review assessment for activities in each of the management areas and their corresponding management objectives and directions.

Research Plans

REQUIREMENT FOR A RESEARCH PLAN

As a requirement of EHV MPA Regulations (Appendix 1), a research plan must be submitted to DFO at least 90 days before commencement, regardless of the type of research. The research plan must provide detailed information on specific target locations and planned scientific activities, including the techniques to be used and consideration of potential environmental impacts.

A foreign research vessel is exempt from the requirements to submit a scientific research plan to DFO if the information required by the EHV MPA Regulations was already submitted in writing to obtain consent under the *Coasting Trade Act*. However, scientific research carried out with this consent must be conducted in accordance with all other environmental protection and management requirements contained in the MPA Regulations. In addition, the Minister of Foreign Affairs and International Trade may attach terms and conditions to the consent. DFO reviews these foreign research applications and provides advice to the Minister of Foreign Affairs and International Trade on terms and conditions related to the consent. As well, Section 44 of the *Oceans Act* enables

conditions to be attached to *Coasting Trade Act* consents that require foreign researchers to supply the results.

REVIEW OF RESEARCH PLANS

Following receipt of the research plan, the MPA manager reviews it to answer the following questions:

- Does the research contribute to meeting the management and conservation objectives of Endeavour?
- Are the research activities appropriate for the proposed work area(s)?
- Based on the prospective stressors of the research activities, have the appropriate mitigation measures been included in the plan (Appendix 6)?
- Are the studies designed with attention to the Code of Conduct (Appendix 8)?
- Are the proposed activities compatible (and ideally, coordinated) with other research activities in the area?

A scientific research review form (Appendix 7) has been developed to assess research plans. Currently the EHV MPA manager completes this form based on the research plan to ensure that all required information is included and that the proposed activity is consistent with the EHV MPA Regulations. The completed form then serves as a checklist to review the plan. In future, this checklist should be included in the clearance application process for researchers to complete.

Once the Manager reviews a plan, guidance may be attached, including, among others, a request for cruise results, requests related to impact mitigation, monitoring and on-board observers for the management support system when operational. As part of the research and monitoring strategy, it is a priority over the next five years to identify knowledge gaps that may be satisfied through requests for data, as a condition of licence to sample, to improve our ability to monitor the EHV MPA.

CHANGES TO RESEARCH PLANS

Researchers are required to conform to the activity description that they have submitted. A change to the research plan while at sea may mean that the research is no longer in compliance with the MPA Regulations. Thus, changes to the originally submitted plan should be immediately conveyed to DFO.

Management Areas

The management areas for EHV MPA correspond to the principal vent fields identified in the ecological characteristics section (Figure 1, Box 2):

- **Salty Dawg**
- **High Rise**
- **Main Endeavour**
- **Mothra Field**

The Sasquatch vent field was discovered in 2000 and visited again in 2003. Management aims will be identified for Sasquatch by 2012.

While the objectives identified earlier will consistently provide the guidance for management of all parts of EHV MPA, defining management areas provides the flexibility to distinguish areas of minimal potential impacts as well as areas for scientific research and monitoring activities that contribute to the conservation, protection and understanding of the area. For example, Main and Mothra vent fields, which have historically been subject to intensive research activity, will remain the key areas for studies to improve our understanding of this ecosystem. At the same time the classification of the Salty Dawg and High Rise Management Areas as off-limits to all but minimally intrusive study techniques is consistent with the precautionary approach, highlighted in EHV MPA Management Principles and Objectives (Box 5). The decision to encourage or discourage activities in each area will be guided by the management directions developed for each area (draft Endeavour Hydrothermal Vents MPA Management Plan,

2001) summarised below, and the description of acceptable impacts by area outlined in the Research Activity Review Framework (Canessa, 2005).

MANAGEMENT AREAS PURPOSE AND MANAGEMENT DIRECTIONS

Salty Dawg

Few activities currently take place in the Salty Dawg vent field, leaving it a relatively pristine portion of Endeavour area. Thus the highest level of precaution is applied at this management area, keeping this vent field free of potentially impacting activities and maintaining it as a highly protected area that can also serve as an observational research site. Observation-based or other minimally intrusive study techniques that contribute to the understanding of environmental impacts of human activities on hydrothermal vent ecosystems will be encouraged. All other activities proposed for the EHV MPA will be redirected to one of the other three management areas, as deemed appropriate.

Management for Salty Dawg will encourage activities as follows:

- infrequent water sampling (no more than once per year), and visits to a single monitoring instrument (maximum once per year). These would be the only activities encouraged on or near the seafloor in the Salty Dawg Management Area;
- acoustic imaging of the field, particularly repetitive mapping to document changes in the area; and
- water column investigations that have no impact on the seafloor or benthic/near-bottom ecosystems.

High Rise

The High Rise vent field will be reserved for projects focused on education/outreach, excluding more intrusive activities (e.g. extensive biological sampling, installation of mooring arrays, etc.).

The High Rise vent field has only been of moderate interest to research activities, resulting in a more pristine environment as compared to other fields in the area. High Rise is relatively unspoiled and boasts impressive natural features making it an ideal subject for public education and outreach. Thus the primary management focus in the High Rise Field will be to accomplish objectives of the Education and Outreach Strategy for the Area. In particular, a single, long-term monitoring site would be encouraged both as a research tool and as an important component of the education/outreach strategy of the Marine Protected Area. Other activities proposed for the area will be redirected to one of the other three vent fields, as deemed appropriate.

Mothra and Main

The aim is to manage the Mothra and Main Endeavour vent fields for research projects.

The Mothra and Main Endeavour vent fields are the most intensively studied venting fields within the area. Activity in the area has included a wide spectrum of research activities from observational to intensive sampling operations. Research will continue to be the primary management focus for the Mothra and Main fields. Research activities, including those involving moderate sampling, will be encouraged provided that they are consistent with the conservation objectives for the Area.

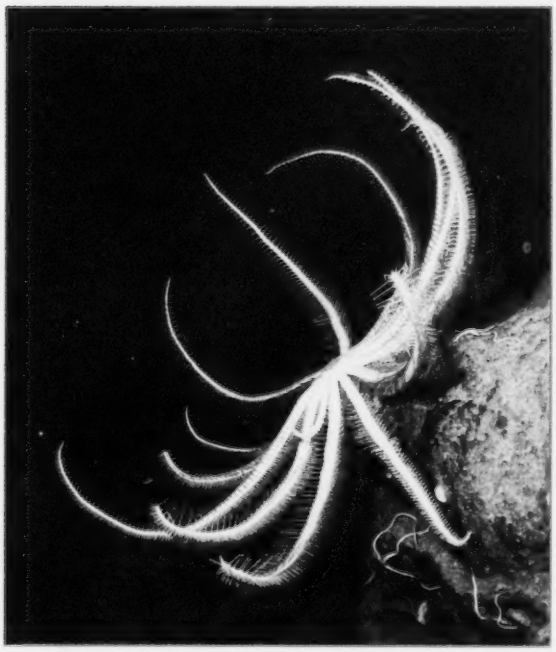
To adequately delineate and make decisions regarding activities in the management areas and associated vent fields, there is a need to update our mapping data to the highest quality and resolution currently available. This is a main priority for the five years guided by this management plan.

Mitigation measures

Stressors such as light, seismic and acoustic inputs, debris, permanent structures and physical sampling or disturbance may potentially have continuing, cumulative impacts on the Endeavour ecosystem. Currently, more research

is required to establish baselines against which human impacts may be measured. In the interim, management measures can be implemented in a precautionary way to ensure that disturbances to the ecosystem by scientific research are minimised. This will help to ensure that work performed at the EHV MPA contributes to responsible understanding of the ecosystem in pursuit of the EHV MPA conservation objective. A list of potential stressors and recommended interim management measures or management area-specific suggestions can be found in Appendix 6.

Note that these mitigation measures are supplemented by the InterRidge Statement of Commitment to Responsible Research Practices at Deep-Sea Hydrothermal Vents, as described in Appendix 8. Consistent with section 44 (b) of the *Oceans Act* (R.S. 1996, c. 31), the Statement of Commitment will be considered for official endorsement by DFO as it applies to the EHV MPA.



Cruise reports

Consistent with section 44(a) of the *Oceans Act*, DFO will request that DFAIT attach conditions of consent to foreign research requiring all proponents conducting activities in the EHV MPA area to submit cruise reports within two months of the conclusion of all at-sea activities. The MPA manager requests that a member of the science staff, usually the Chief Scientist, self-identify as the data provider and contact that bears responsibility for submitting a preliminary report and then at a later date a final cruise report with data. The manager may request specific data to address identified knowledge gaps, in addition to a general request that cruise reports include:

- specific sampling locations, samples collected (size and species if available), what study was or will be conducted on the sample, and the fate of samples (e.g. sample preserved, kept for lab/museum, discarded, etc.);
- locations and life span of instruments installed on the ocean floor;
- geo-referenced video of entire submersible dive (surface to surface);
- observation of impacts or incidents (e.g. materials left behind, submarine contact with chimney resulting in damage); and
- raw data and results of research activities conducted within the MPA.

With regard to foreign vessels, section 44(a) of the *Oceans Act* states that the Minister of Fisheries and Oceans may request the Minister of Foreign Affairs and International Trade to attach to a consent under the *Coasting Trade Act* a condition that the ship supply the Minister with the results of the marine scientific research conducted. DFAIT forwards copies of research reports and data to DFO, which in turn forwards it to the applicable region. The Government of Canada can summarise or refer to the data arising from foreign cruises, and consult and make use of it for its own scientific research, but

copyright law for publication considerations govern the use of the data.

Logsheets that are to be incorporated as a condition of licence will improve the post-cruise reporting data quality; and as a priority for this management plan period further work will be directed toward ensuring accurate and timely submission of cruise results consistent with section 44(a) of the *Oceans Act*.

Endorsement of InterRidge Code of Conduct

The "InterRidge Statement of Commitment to Responsible Research Practices at Deep-Sea Hydrothermal Vents" (Appendix 8) outlines appropriate guidelines for research activities that avoid deleterious impacts or degradation of hydrothermal vent populations or habitats. This code has been adopted by the InterRidge research community and InterRidge has authorised the use of this as the Code of Conduct for the EHV MPA. The Endeavour Hydrothermal Vent MPA endorses the InterRidge Statement of Commitment to Responsible Practices at Deep Sea Hydrothermal Vents and expects researchers to adhere to these guidelines when conducting activities within the MPA.

Development of a Management Support System

A project charter for a Management Support system (MSS) was developed in 2005.

The EHV MPA Management Support System will be a spatial database and web mapping system for use in the management, monitoring and reporting of human activities in the Marine Protected Area.

Components of the MSS include:

- the development of a data management tool, a relational geo-database to link attribute data (vessel information, research activity) to spatial data (location of research activity, ROV deployment, moored sampling equipment). The tool would assist in the identification of areas to examine for human impact; coordinate planned research projects; and identify areas that may require greater/lesser coverage;
- expansion of the data management tool to web mapping application to disseminate MPA use information to researchers and the general public; and
- The development of a high resolution multibeam bathymetry base map by Canadian Hydrographic Service to provide necessary baseline data of the MPA.

Information will be obtained through existing processes as much as is possible and appropriate (e.g. foreign vessel cruise request process, Canadian Coast Guard, NEPTUNE Canada, Ridge 2000, etc.), rather than developing additional processes.

GOVERNANCE

DFO has the primary responsibility for the protection and management of the EHV MPA, as highlighted in the duties and responsibilities outlined in detail in Appendix 5. However, the EHV MPA is offshore and requires special equipment and vessel time to explore and the main user groups are Canadian and foreign researchers. These characteristics require the coordination of a number of government agencies to implement relevant legislation and guidelines.

Fisheries and Oceans Canada

As the lead authority for the EHV MPA, DFO is the key decision-maker for EHV MPA concerning overall management advice, responding to the Technical Advisory Committee (TAC) and considering other departmental programs (e.g. science, fisheries management and other conservation initiatives). The Oceans, Habitat and Enhancement Branch (OHEB) is the lead organisation within DFO Pacific Region. Using an integrated management

approach, OHEB will serve an overall facilitation and coordination function for implementation of the plan and management of the EHV MPA. OHEB provides ongoing advice to those considering activities in Endeavour area and coordinates reviews of research plans received through the plan submission process.

DFO and the TAC work closely together to address issues or concerns for the MPA, review activity proposals for their suitability and provide guidance for questions regarding scientific capacity for monitoring, evaluation and indicators. To ensure effective and timely communication between DFO and the TAC, a representative from OHEB serves as chair of the TAC and a DFO Science representative is responsible for linking with the TAC.

Technical Advisory Committee

The ongoing participation and involvement of a variety of federal and provincial government bodies as well as industry and public interests is essential for collaboration towards the effective conservation of the Endeavour ecosystem. To facilitate ongoing dialogue and implementation of the management plan, DFO formed the Endeavour Technical Advisory Committee. As indicated by the current membership (Appendix 4), members represent government and non-government interests in Endeavour and have skills, knowledge and experience related to the ecology, management, conservation and use of the area. An overview of the key responsibilities of government departments and non-government bodies as they relate to the MPA are outlined in Appendix 5.

ESTABLISHMENT AND LEGAL AUTHORITY

Section 32 of the *Oceans Act* provides the Minister of Fisheries and Oceans with the authority to establish, designate or recognise advisory bodies. The TAC has been established to advise DFO on the conservation and management of Endeavour Hydrothermal Vents MPA. The region of interest to the Committee corresponds with the geographic limits described in Endeavour Hydrothermal Vents Marine Protected Area Regulations (SOR 2003-87). The TAC does not have legal or delegated powers, nor does it replace the regulatory mandate or decision-making authority of existing government bodies. The TAC provides advice to DFO and other regulators who make decisions related to Endeavour and its management.

PURPOSE

In general, the EHV TAC provides advice and recommendations to Fisheries and Oceans Canada towards the conservation, management and communications of Endeavour Hydrothermal Vents Marine Protected Area. The Committee serves as the primary consultative body for the MPA, facilitating the ongoing and direct involvement of core interests.

The TAC will be composed of a cross-section of stakeholders and federal government agencies and will be tasked with providing advice to DFO towards the management of the Area. Use of such a management structure will allow DFO to strengthen relationships forged with stakeholders and government agencies and enable the development and application of innovative strategies.

The committee was involved with the MPA assessment requirements and establishment process and continues to play a role in ongoing management of the MPA. The TAC provides:

- a regular forum to exchange information and views amongst a core group of government and non-governmental organisations with interests in Endeavour;
- reviews of the development of management plan components, regulatory proposals and associated materials;
- advice to DFO on the technical merits of proposals for activities within the MPA boundary; and

- input into the activities of other organisations or bodies involved in the research, protection and management of Endeavour.

Future discussions may further develop the roles and responsibilities of the committee. The terms of reference for the committee will be posted on the Endeavour website once they are approved.

Partnering Arrangements

Government and non-government organisations play a role in managing Endeavour MPA and ensuring it is protected for future generations (Box 8).

There are roles and responsibilities related to legal requirements for both government departments and users of the area. However, others with an interest in the MPA can play a role through providing advice on management, carrying out research, undertaking outreach, or participating in stewardship activities in the MPA. Appendix 5 provides an overview of the key responsibilities of government departments and non-government bodies as they relate to the MPA.

Where appropriate, existing planning and regulatory approval mechanisms used to manage ocean activities will be used to facilitate compliance with the Regulations and communication of the plan objectives.

Box 8: Partnering Arrangements

Working with individuals, communities, stakeholders and interest groups

While DFO has jurisdictional responsibility, overlaps and limits to the department's authority make accountability an important issue. Co-operation and co-ordination between DFO, TAC member organisations and other stakeholders is essential to assure the shared accountability for achieving the objectives and protecting the area. The TAC provides the central mechanism for fostering relationships with other interested parties or organisations.

Working with Aboriginal Peoples

Based on pre-designation presentations made to the Central Region Board, there are understood to be no substantive First Nation interests in the EHV MPA. However, given the area falls within the statement of intent area of the Nuu-chah-nulth Tribal Council (NTC) Treaty claim, the NTC may in the future have an interest in engaging in the management of the MPA.

Working with Other Government Departments

Although DFO has the overall responsibility for managing and administering the MPA, several other departments and agencies also play a significant role in managing activities in and around the MPA (see Appendix 5 for a summary of responsibilities by department). Although each regulatory body has different responsibilities and interacts with different sectors, they have a common goal of promoting compliance with Government of Canada Regulations, in this case those of the EHV MPA. Core responsibilities for these departments as they relate to Endeavour include:

- promoting awareness and compliance of authorised activities with the Regulations;
- assisting DFO with compliance and surveillance activities; and
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- promoting awareness and compliance of authorised activities with the Regulations;
- assisting DFO with compliance and surveillance activities; and
- encouraging outreach and research activities to raise awareness of the MPA and minimise impacts from human activities.

SURVEILLANCE, ENFORCEMENT AND COMPLIANCE

A coordinated and integrated approach to compliance and enforcement is required for the MPA given its remote offshore location and the overlapping nature of ocean use, management jurisdictions and potential interactions and impacts in the area. The following section describes the lead enforcement role of DFO/CCG and the supporting roles of several other government authorities.

Specific Roles and Responsibilities

Fisheries and Oceans Canada

As the lead federal authority for the MPA, DFO has overall responsibility for ensuring that the Regulations and conservation measures are respected and enforced, while other agencies also have accountabilities under their own mandates in the area (particularly DFAIT). DFO's role is undertaken through the Department's legislated enforcement mandate and responsibilities under the *Oceans Act*, the *Fisheries Act,* the *Species at Risk Act* and other federal legislation covering fisheries conservation, environmental protection, habitat protection and marine safety. DFO also provides a leadership and coordination role for broader inter-agency surveillance, monitoring and enforcement activities in support of the MPA. Under this coordinated approach, DFO plays a support role for enforcement matters falling under the jurisdiction of another government authority.

CONSERVATION AND PROTECTION

The primary means of surveillance and enforcement in the MPA is through DFO's Conservation and Protection Program. The MPA is included as part of regular aerial surveillance patrols of the Canadian EEZ in the Pacific Region. During these patrols, fishing and other types of vessels in the MPA are identified, recorded and reported through the DFO's surveillance information system. Owing to the remote offshore location and the seasonal nature of fishing activities being monitored, dedicated and year-round coverage of the MPA is not achieved solely through DFO's fisheries surveillance program. Integrated computer programs have been developed to collect and analyze multiple sources of information to provide an operational picture of activity in the MPA year-round (i.e. the Management Support System). This operational picture is augmented by additional surveillance information on commercial shipping activity obtained through the DFO aerial surveillance program and in cooperation with Canada's Maritime Forces.

In addition to its general MPA enforcement activities, DFO is responsible for fisheries enforcement matters related to the MPA. Fisheries violations can result in charges under both the *Fisheries Act* and the *Oceans Act* as Fishery Officers are designated as enforcement officers under both pieces of legislation.

In the case of marine research activities in the MPA, DFO will monitor compliance through activity reporting provisions under the *Oceans Act*, the *Fisheries Act* and, with support from DFAIT, through the *Coasting Trade Act* (i.e., through the Foreign Vessel Clearance Request process). Violations of the MPA Regulations carry penalties under the *Oceans Act*, and contraventions of licences and consent for foreign vessel access can also result in charges under the *Fisheries Act* and the *Coasting Trade Act*.

The enforcement provisions of the *Species at Risk Act* may also be used in support of the MPA when dealing with listed species. Fishery Officers are designated as enforcement officers for the *Species at Risk Act* and violations may result in charges under this legislation, as appropriate.

CANADIAN COAST GUARD

The Canadian Coast Guard provides support to MPA monitoring through its vessel scheduling committee, emergency response, vessel traffic management and pollution surveillance programs. This includes the role of the Coast Guard's Regional Operations Centre (Victoria, BC) to receive incident reports and coordinate government responses as required. The Coast Guard has included the MPA in its regional environmental response plan and will provide a leadership and operational role in the event of an environmental emergency.

OBSERVATION AND INCIDENCE REPORTING

Consistent with provisions under the *Coasting Trade Act* administered by DFAIT, vessels carrying out activities in the area are required to reserve berth space to allow Canadian participation during the research cruise. In the context of Endeavour, the EHV MPA Manager may request this berth be used for a Canadian observer aboard cruises to advance the conservation, management and better understanding of the MPA. In particular, this observer berth may be pursued for cruises with education/outreach potential to advance communication regarding the EHV MPA. In addition, DFO encourages ocean users to observe violations of the *Fisheries Act*, record their observations and report violations to the department.

Other Government Departments

In addition to DFO, a number of government authorities are involved in the surveillance, monitoring and enforcement of activities in the MPA (see Appendix 5 for roles and responsibilities). Under this coordinated, inter-agency system, each government authority operates according to its enforcement mandate and capabilities through existing cooperative arrangements or through new arrangements as required.

Wherever possible, MPA-related tasks are incorporated into existing agency enforcement and compliance programs. General controls and conditions for ocean activities are implemented, monitored and enforced through relevant management mechanisms, such as those for pollution prevention. For activities requiring involvement by multiple agencies, existing interdepartmental arrangements and Memoranda of Understanding could be used to incorporate MPA enforcement considerations, where applicable.

EDUCATION AND OUTREACH STRATEGY

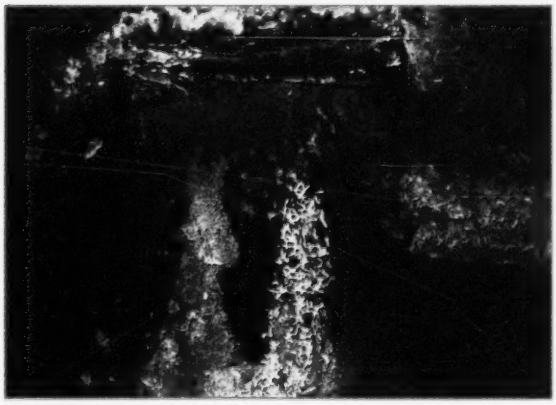
Endeavour is more than 200 kilometres off the coast of B.C., and although it offers few hands-on educational opportunities, the MPA provides an excellent opportunity to raise public awareness about deep ocean environments. It can also educate the public about activities undertaken to protect unique deep-water marine ecosystems in Canada's offshore in general and in MPAs in particular.

For EHV MPA to be successfully protected, affected user groups and the general public should be aware of the MPA designation and its Regulations and guidelines to improve compliance. In the case of EHV MPA, the main user groups are the scientific community, which may have substantial knowledge of hydrothermal vents but be unaware of the MPA status of Endeavour specifically, and vessel operators, who may have only some knowledge of vents and the MPA designation.

With guidance from an Education and Outreach Strategy (Southam, 2006) and the management objectives, key education and outreach priorities have been identified and will carried out as resources permit. These priorities are to:

1. finalise and implement the Outreach Plan (Eclipse, 2008);
2. develop an Education Plan;
3. update Endeavour web material;
4. formalise the use of photography to facilitate release of images for educational use;
5. develop key outreach materials for researchers/EHV MPA users; and
6. distribute outreach materials to vessel access authorities for dissemination to EHV MPA users.

These priorities are intended to enhance awareness and understanding of the MPA, as well as improve compliance with MPA Regulations among scientists, researchers and vessel operators while visiting Endeavour.



RESEARCH AND MONITORING STRATEGY

DFO wishes to encourage research at EHV MPA while meeting its conservation objective, currently within a limited-data environment. Research in the EHV MPA thus has a dual identity: first, as a human use with potential impacts which management measures seek to address; and second, as a generator of data, knowledge and information valuable for the adaptive management of the MPA. Accordingly a research strategy must serve the dual purposes of:

- developing an organised method of addressing information gaps; and
- coordinating and reviewing proposed research activities to minimise impacts and improve conservation and protection.

To this end, the strategy must develop monitoring protocols that will:

- provide information about the state of the environment – to improve understanding of the habitat and its communities; and
- provide ongoing indication of human impacts – to gauge compliance and determine whether management measures are achieving their intended results.

Development of a Research and Monitoring Strategy

The strategy will be developed and regularly up-dated at agreed upon intervals (2-5 years) by DFO. It could contain:

1. management concerns with supporting evidence or rationales;

2. brief description of the goals for the period of the research plan and links between these goals and the management plan; and

3. research priorities based on management concerns, considering the following factors:

    - immediate or evolving management issues that may be resolved through directed research projects;
    - the prospects of research already in progress; and
    - the availability of funds, equipment and instruments for research support

Ultimately, monitoring should meet the overlapping needs for ecological and compliance data, as outlined in Box 9.

Information Needs

This plan acknowledges that present information is insufficient for the development of quantitative indicators or the development of expected impacts and affected habitats. The research strategy should identify the gaps so they may be addressed; while making use of the information that is currently available to provide initial, qualitative indication of the status of the EHV MPA. As a first step the following scientific question has been proposed.

"What is the extent of impact by research versus natural perturbations?"

To answer this question, the following information needs have been identified:

1. geographic extent of identified habitats or species ranges (e.g. general size/extent of known clam beds, tubeworm colonies, etc.);
2. relative density of target species (e.g. through photos or video transects, relative densities of tubeworm colonies);
3. biological specimen sampling rates (through users' input to a logbook or harvest log sheet);
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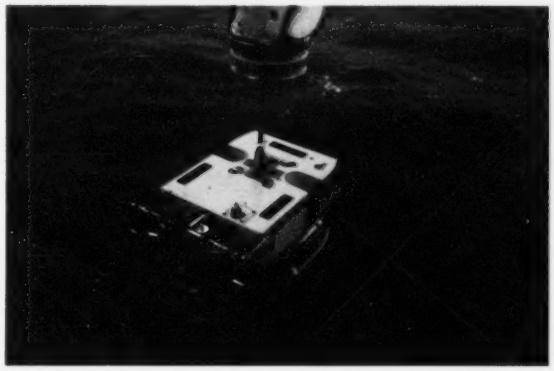

Box 9: Monitoring Needs

ECOLOGICAL MONITORING	COMPLIANCE MONITORING
Establish baselines and thresholds for taking management action.	Track effectiveness of management measures
Determine features and processes of the natural environment	Determine what is occurring in the MPA with respect to human activity/stressor levels
Build foundations for marine environmental quality (MEQ) indicators	Enable the distinction of human impacts from natural variation
Provide data for modelling/other research designs	Determine general trends in human activities/impacts
Ensure necessary information is obtained to measure natural variability	Coordinate research activities, equipment and data
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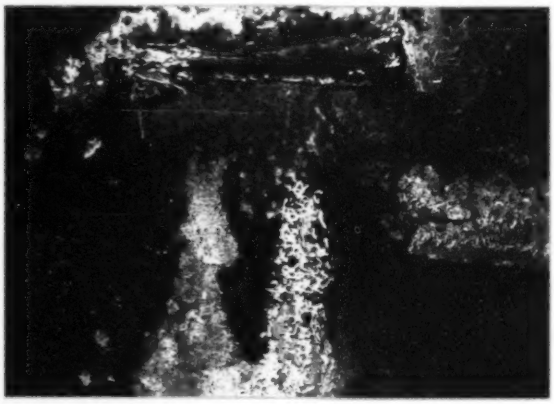

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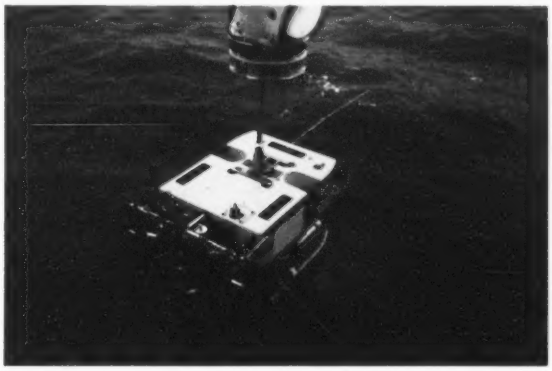

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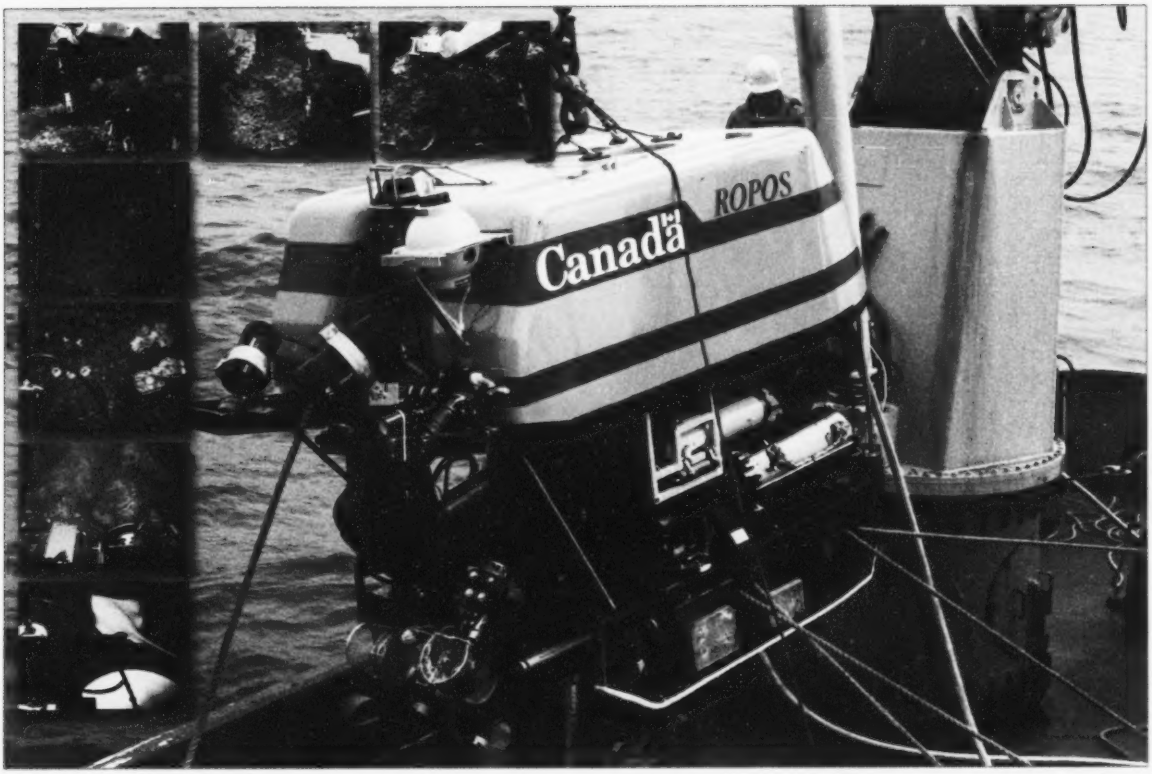


preserved, available at museums, universities, etc., for other researchers to use?);

5. high resolution maps of vent areas, habitat locations and areas, as well as areas most frequently recorded; and

6. effects of stressors from human activities including light.

Indicators

Similarly, as an initial step to providing indication of human use and ecosystem state, indicators could measure the stressors themselves and the implementation of management measures.

1. Stressors, characteristics and impacts:

    - amount, pace, degree, locations, distribution of activities in the EHV MPA (e.g. amount and source of noise, light, debris). As research results build a sufficient knowledge base, indicators can be used to gauge the impacts of these stressors as well.

2. Management measures, implementation and efficacy:

    - Research Activity guidance reviewed for agreement with management objectives;
    - Research Access requests reviewed to evaluate the planned activities within the MPA: attempts to discourage duplicate sampling, conflicting instrumentation operation;
    - cruise plans and logsheets monitored for timely and complete returns;
    - cruise plans and logsheets monitored for consistency of activities with management area objectives; and
    - a process for contacting domestic vessels carrying out activities in the area not captured within the current vessel clearance request process (if any) will be developed and implemented.

Tools for the Implementation of Research and Monitoring Strategy

Once developed the research and monitoring strategy can be implemented through the use of:

1. Research Vessel Clearance Request Process

    - The vessel clearance request process would require researchers to identify that they wish to work in Endeavour MPA, submit a research plan and complete a proposed activities information sheet prior to consent being issued. Licences would be required for any invasive sampling and a condition of licence may be the completion of logsheets.

    - Researchers would be requested to submit logsheets and cruise reports to the MPA manager at the conclusion of the cruise. Requested data will help address identified information gaps and components of the Management Support System (as outlined in point 3 below).

2. Cruise reports

    - Accurate reporting through cruise reports and logsheets will be requested for inclusion in consent issued involving access to the MPA to facilitate compliance with conditions in place consistent with section 44(a) of the *Oceans Act*.

3. Management Support System

    - The management support system will encourage coordination among researchers to avoid instrument conflict and duplication of effort which may have ecological and economic costs.

    - The MSS will capitalise on the science opportunities that will come with NEPTUNE Canada.

    - The MSS will assist with tracking, measuring and monitoring human activities within the MPA. A spatial database will enable a better understanding of human impacts within the area.

MANAGEMENT PLAN REVIEW

The current management plan is intended to guide management of the EHV MPA from 2010 to 2015. The management plan will be reviewed every five years, or as deemed necessary by DFO and the TAC based on changing understanding of the management area. The overall evaluation of the plan and its implementation will look at "outputs" (e.g. determining if identified activities were carried out) and "outcomes" (e.g. determining if the activities met management plan objectives).

The Management Measures section outlined the current suite of available measures and goals including those that are attainable in the short term (e.g. adopt InterRidge Statement of Commitment to Responsible Research Practices at Deep-Sea Hydrothermal Vents) as well as those that will only be feasible with longer term commitment (e.g. develop monitoring strategy with DFO Science). For the five years guided by this management plan, a list of priority activities is identified (Box 10). The review will assess priorities and accomplishments in consideration of events in the preceding years and identify priorities for the next iteration of the management plan.

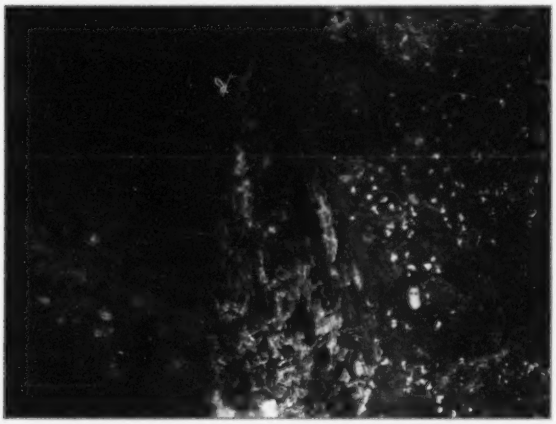
Details of year-to-year activities will be provided through an annual work plan. The MPA manager will also produce an annual report as part of the review process to track the

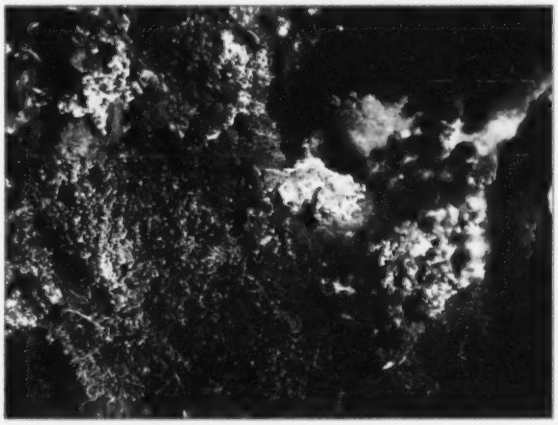
Box 10: Identified Priority Activities for 2010–2015 Management Period

Priority	Responsibility
Improving EHV MPA mapping accuracy	MPA manager, with assistance from TAC
Applying Vessel Access Process consistently	DFO Sectors working with MPA Manager (considering advice from TAC)
Identifying knowledge gaps with respect to management objectives.	MPA manager, DFO Science and TAC
Applying guidance of access to encourage collection of needed data	MPA manager
Improving timeliness of post-cruise reporting	MPA manager
Applying the Management Support System to encourage sample/data sharing	MPA manager with DFO Science
Developing strategy for ecological monitoring and management plan effectiveness monitoring.	MPA manager, DFO Science and TAC

implementation of activities identified in the management plan, set out accomplishments for the previous year as related to the objectives and priorities identified in the plan, and identify new priorities. The annual reports, which provide a form of ongoing review, will contribute to the complete review of the plan.

An evaluation framework is in development for the review of the Endeavour management plan. The framework will identify indicators for each MPA objective to track progress toward meeting those objectives. Once developed, these indicators will be reported in the annual report as well as the overall review.





REFERENCES

Canessa, 2005. Endeavour Hydrothermal Vents Marine Protected Area Research Activity Review Framework.

Delaney, J. 1998 (unpublished). Not Much is Known About What's Left to be Discovered. A Scientist's Perspective on the Endeavour Marine Protected Area, Northern Juan de Fuca Ridge. A response to the invitation by DFO-MPO administrators to provide input to the dialogue on scientific usage of the Endeavour Marine Protected Area.

DFO, 1999. Endeavour Hot Vents Area. A Pilot Marine Protected Area in Canada's Pacific Waters. Ecosystem Overview: Ecological, Social and Economic Components.

Eclipse, Inc., 2008. Outreach Plan: Endeavour Hydrothermal Vents MPA.

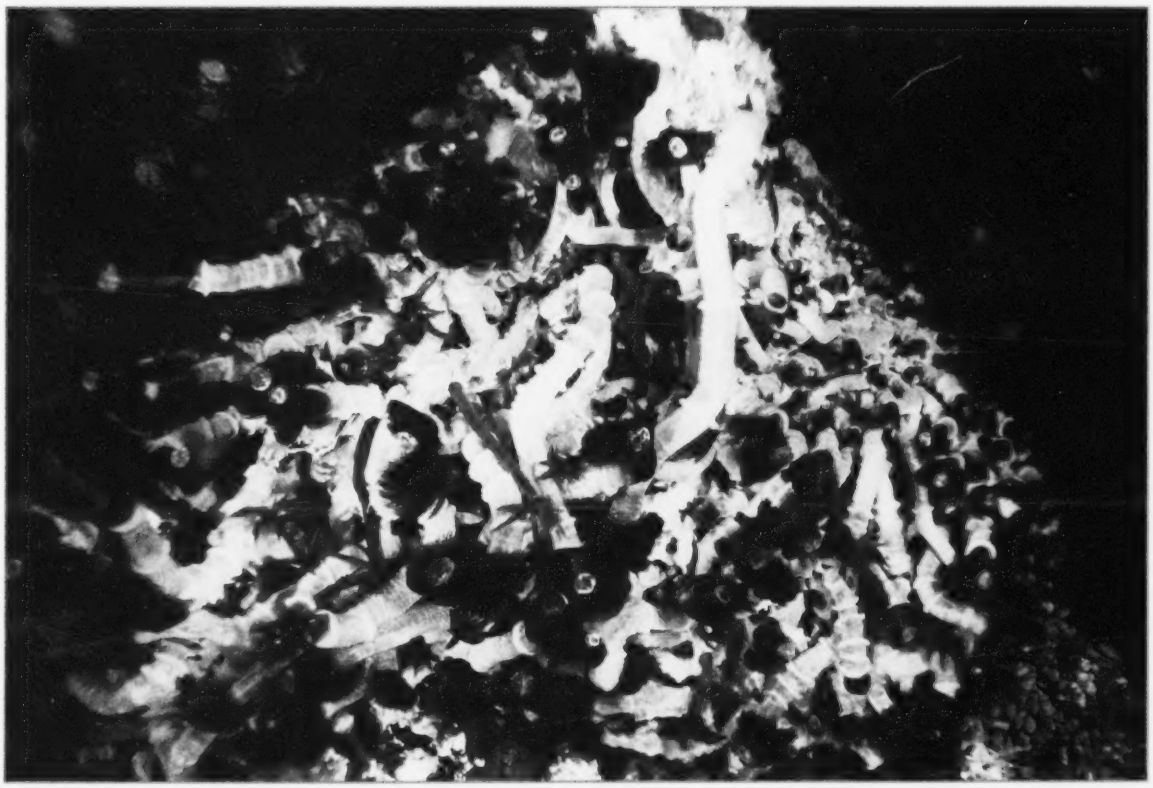
Kelley, D.S., J.R. Delaney, M.D. Lilley and D.A. Butterfield, 2001. Vent Field Distribution and Evolution along the Endeavour Segment, Juan de Fuca Ridge. EOS Trans. AGU 82 47, F612 (2001).

Scott, S.D., 2001. (Unpub.) Mineral Development Scoping Study for the Proposed Endeavour Hot Vents Marine Protected Area. Report prepared for Natural Resources Canada April 1 2001.

Southam Consulting Inc., 2007. Education and Outreach Strategy Endeavour Hydrothermal Vents Marine Protected Area.

Tunnicliffe, V. 2000. A Bestiary of the Endeavour Hot Vents

Tunnicliffe, V., and R. Thompson, 1999. Oceans Background Report. The Endeavour Hot Vents Area: A Pilot Marine Protected Area in Canada's Pacific Ocean.



APPENDIX 1: EHV MPA Regulations

Endeavour Hydrothermal Vents Marine Protected Area Regulations

SOR/2003-87

Registration March 4, 2003

OCEANS ACT

Endeavour Hydrothermal Vents Marine Protected Area Regulations

P.C. 2003-283 March 4, 2003

Her Excellency the Governor General in Council, on the recommendation of the Minister of Fisheries and Oceans, pursuant to subsection 35(3) of the *Oceans Act*[a], hereby makes the annexed *Endeavour Hydrothermal Vents Marine Protected Area Regulations*.[a] S.C. 1996, c. 31

ENDEAVOUR HYDROTHERMAL VENTS MARINE PROTECTED AREA REGULATIONS

DESIGNATION

1. The area of the Pacific Ocean — the seabed, the subsoil and the waters superjacent to the seabed — that is bounded by a line drawn from a point at 47°54′N, 129°02′W, from there west to a point at 47°54′N, 129°08′W, from there north to a point at 48°01′N, 129°08′W, from there east to a point at 48°01′N, 129°02′W, and from there south to the point of beginning, is hereby designated as a marine protected area to be known as the Endeavour Hydrothermal Vents Marine Protected Area (the "Area").

PROHIBITIONS

2. No person shall

(*a*) disturb, damage or destroy, in the Area, or remove from the Area, any part of the seabed, including a venting structure, or any part of the subsoil, or any living marine organism or any part of its habitat; or

(*b*) carry out any underwater activity in the Area that is likely to result in the disturbance, damage, destruction or removal of anything referred to in paragraph (*a*).

3. (1) No person contravenes section 2 if

(*a*) the disturbance, damage, destruction or removal is for scientific research for the conservation, protection and understanding of the Area;

(*b*) subject to subsection (3), a research plan described in subsection (2) is submitted to the Minister at least 90 days before the start of the scientific research in the Area; and

(*c*) all licences, authorizations or consents required under the *Oceans Act*, the *Coastal Fisheries Protection Act*, the *Coasting Trade Act* or the *Fisheries Act* in respect of the scientific research have been obtained.

(2) A research plan shall include the following information:

(*a*) the name, nationality, overall length, maximum draught, net tonnage, propulsion type, call sign, registration number and port number of each ship to be involved in the scientific research in the Area, and the name of the captain of each ship;

(*b*) the names and positions of the persons who are responsible for the development of the scientific research, and the scientific research personnel who will be on board each ship;

(*c*) the date on which the scientific research in the Area is to start, and the itinerary for each ship while it is involved in the research; and

(*d*) a summary of the scientific research to be conducted in the Area, together with a detailed map of the research area, which summary shall specify

(i) the data to be collected and sampling protocols to be used,

(ii) the other techniques, if any, to be used, such as those involving explosives, radioactive labelling or remotely operated vehicles,

(iii) the equipment to be moored and the method of mooring, and

(iv) the substances, if any, that are intended to be discharged.

(3) A research plan is not required to be submitted under paragraph (1)(*b*) if the information required under subsection (2) has previously been submitted in writing to obtain a consent under the *Coasting Trade Act* to conduct the scientific research.

(4) A person who submits a research plan shall immediately notify the Minister in writing of any subsequent changes to the plan.

SOR/2008-99, s. 15(F).

4. No person contravenes section 2 by carrying out an activity in the Area

(*a*) by means or under conditions that are authorized under subsection 35(2) of the *Fisheries Act*;

(*b*) for which they have a consent under the *Coasting Trade Act*; or

(*c*) for which they have a licence or authorization under the *Oceans Act*, the *Coastal Fisheries Protection Act* or a provision of the *Fisheries Act* other than subsection 35(2).

5. No person contravenes section 2 by carrying out any movement or other activity of ships or submarines if

(*a*) the movement or other activity is carried out for the purpose of public safety, law enforcement, or Canadian sovereignty or national security; and

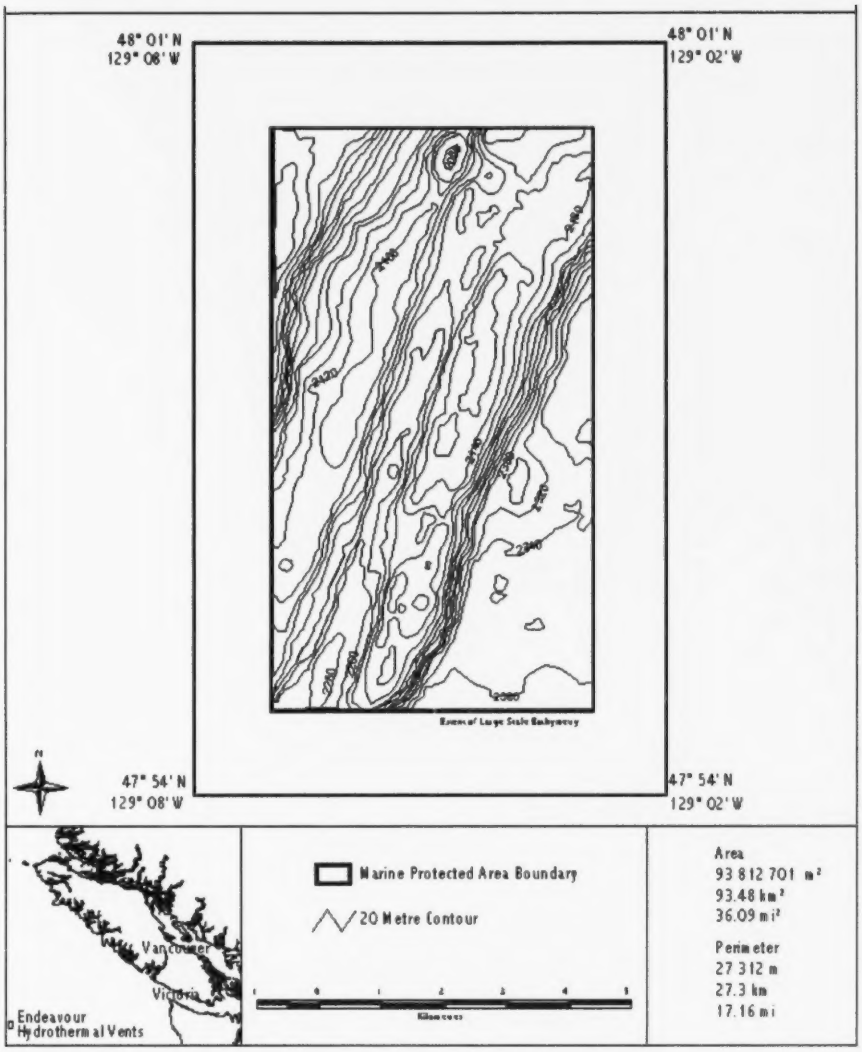
(*b*) the ships or submarines, as the case may be, are owned or operated by or on behalf of Her Majesty in right of Canada or by foreign military forces acting in cooperation with, or under the command or control of, the Canadian Forces.

SOR/2008-99, s. 16(F).

COMING INTO FORCE

6. These Regulations come into force on the day on which they are registered.

APPENDIX 2: EHV MPA Boundaries



From Regulatory Impact Analysis Statement
URL:<http://canadagazette.gc.ca/partII/2003/20030312/html/sor87-e.html>

APPENDIX 3: Actions Identified in the Management Plan

The table below summarises the priorities identified throughout this management plan. These priorities give consideration to current data environment, regulatory responsibilities, operational requirements of DFO, and advice from the EHV MPA TAC.

Theme	Activities
Activity Review and Reporting Compliance	Apply Research Activity Review Framework consistently for foreign and domestic research requests.
	Manage, review and respond to access requests with guidance from TAC where appropriate
	Apply guidance of access to encourage collection of needed information
	Obtain biological/compliance data from cruise reports, logbooks, video, etc.
	Improve timely follow-up through cruise plans and post cruise reporting
Monitoring and Research	Develop monitoring strategy with DFO Science
	Develop detailed data gap analysis
	Use geo-referenced database (MSS) to enhance coordination of vessels, instruments, sampling; reduce areas of duplicate effort and multiple sampling
	Improve mapping data (resolution/accuracy): incorporate into the MSS and management approach
Education and Outreach	Implement Outreach plan
	Develop Education plan
	Update Endeavour web material (TAC terms of reference, published and unpublished documents of interest, instructions for potential researchers, updated maps, photography, video)
	Formalise photography use agreement – facilitate ease of release for educational purposes
	Develop key outreach materials for EHV users
	Advise appropriate vessel scheduling/access authorities of Endeavour cruise planning/reporting requirements; provide outreach materials for dissemination to EHV users
Management Plan Performance Review	Develop annual report
	Review annual reports and perform overall review every five years
	Develop annual workplan
	Identify research/management priorities
	Develop monitoring framework to assess MPA effectiveness
Surveillance and Enforcement	Maintain communication with DFO Conservation and Protection Branch and the Department of National Defence regarding Endeavour MPA enforcement requirements.
	Obtain surveillance coverage information from DFO Conservation and Protection Branch.

APPENDIX 4: Current TAC Membership

Membership of the Committee consists of representation from each of the following:

1. Fisheries and Oceans Canada – Oceans Habitat and Enhancement Branch (1 member);
2. Fisheries and Oceans Canada – Science Branch (1 member);
3. Natural Resources Canada (1 member);
4. Canadian Academic Science (3 members, including one active CanRidge researcher);
5. Foreign Science (2 members, including one R2K representative);
6. Canadian Private Sector (1 member);
7. Public Education/Outreach (1 member); and
8. Environmental Non-Government Organisations, or ENGO (1 member).

APPENDIX 5: Roles and Responsibilities

Regulatory or Advisory Body	Regulatory Responsibilities	Role and Responsibilities Related to EHV MPA
Fisheries and Oceans Canada (DFO)	Lead responsibility for Canada's oceans Develops system of Marine Protected Areas and administer MPA Regulations (*Oceans Act*) Leads and facilitates the development and implementation of integrated management plans (*Oceans Act*) Carries out marine science (*Oceans Act*) Establish advisory bodies for the purpose of the implementation of integrated management plans (*Oceans Act*) Regulates fisheries (*Fisheries Act*:) Protects fish habitat (*Fisheries Act*) Protects critical habitat, and individuals of listed aquatic species at risk; develops recovery plans for aquatic species at risk (*Species at Risk Act*) Responsible for marine safety and security (Canadian Coast Guard)	Lead role in MPA Coordinates management of Endeavour and implementation of the management plan Chair of Endeavour Technical Advisory Committee Responsible for activity reviews Carries out surveillance of activities Provides information to industry (in cooperation with their regulators) and the public on the MPA Maintains Endeavour MPA website Carries out research in the MPA.
Department of Foreign Affairs and International Trade (DFAIT)	Administers *Coasting Trade Act* which provides consent to Canadian waters for foreign researchers	Receives foreign research applications for Endeavour area and sends to DFO for review with respect to the Regulations.
Endeavour Technical Advisory Committee (TAC)	n/a	Provide multi-stakeholder advice to DFO on managing EHV MPA. Forum to exchange information and concerns among a core group of government and non-government organisations about Endeavour MPA. Provide review of the development of EHV MPA management plan components, regulatory proposals and associated materials. Input into the activities of other organisations or bodies involved in the research, protection and management of Endeavour.
Canadian Environmental Assessment Agency	Administers and promotes compliance with the federal environmental assessment process. Promotes sound environmental practices.	Where triggered, assists with environmental assessments carried out in the vicinity of Endeavour.

Regulatory or Advisory Body	Regulatory Responsibilities	Role and Responsibilities Related to EHV MPA
Environment Canada	Responsible for limiting pollution and discharges into the marine environment and managing disposal of waste at sea (*Fisheries Act, Canadian Environmental Protection Act)* Responsible for administering species at risk programs and implementing those related to terrestrial species (*Species at Risk Act*) Manages environmental emergencies. Monitors and protects migratory birds (*Migratory Birds Convention Act*). Key responsibilities for non-aquatic species at risk (*Species at Risk Act*).	Ensures ocean disposal sites and other authorised disposal of waste at sea will not impact the MPA. If an environmental emergency occurred in Endeavour or surrounding area, would coordinate management and clean-up activities.
Transport Canada	Responsible for ship safety and ship source pollution prevention (*Canada Shipping Act*).	Administers Ballast Water Control and Management Regulations (draft).
Industry Canada	Responsible for communications, including licences for submarine cables (*Telecommunications Act*).	Ensure submarine cable licensing proposals are in accordance with the Regulations and management plan
Department of National Defence (MARPAC)	Responsibility for matters relating to national defence (*National Defence Act*). Conducts search and rescue missions Assists other government departments in fisheries patrols and monitoring the oceans environment.	Assist with surveillance and enforcement of MPA Regulations through patrols. Ensure their activities are carried out in accordance with the MPA Regulations and management plan.
Natural Resources Canada	Responsible for administration of non-fuel offshore mineral interests. Responsible for administration and management of offshore oil and gas including associated upstream and downstream activities such as seismic exploration. Carries out marine geoscience research.	Carries out research to support understanding of hydrothermal vent field ecosystem.

APPENDIX 6: Possible Stressors to the Ecosystem from Research Activities

Description of Stressor	Potential Impact	Mitigation
Introduction of energy - Light - Noise (seismic / acoustic)	Potential for continuing, cumulative impact Potential for impacts on SARA listed species (seismic), particularly marine mammals Research required to establish baselines	Monitoring measures: amount of energy (light or noise) to be emitted should be noted in the research plan; the actual amount emitted should be reported post-research in the cruise report. Seismic: Statement of Canadian Practice for the Mitigation of Seismic Noise in the Marine Environment Seismic: DFO Pacific has identified a process to consider seismic proposals consistent with the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment.
Introduction of materials - Garbage/debris - Moorings - Permanent structures - Submersible ballast weights	Potential for cumulative impacts – accumulation/ habitat damage Potential for introduction of non-biodegradable or toxic materials Potential for introduction of exotic microbes	Monitoring: amount of debris to be left behind should be estimated in research plan; actual amount left should be reported post-research in the cruise report. Target: zero tolerance for littering. Minimise amount of materials left in the area from experiments (plastic cable ties, markers, cable, etc.). Discourage dumping of non-biodegradable material or cardboard boxes from ships or platforms. Ballast weights should be released off-axis unless unsafe to do so. Remove structures where possible and safe to do so, or where less disturbance would be caused by leaving them (e.g. cable). Limit the footprint of anchored instruments and the cumulative footprint of more than one. Consider sterilisation of submersible ballast tanks prior to dive.

Description of Stressor	Potential Impact	Mitigation
Sampling, removal or disturbance of abiotic or biotic components - Physical/Biological sampling - Removal of organisms or materials - Accidental damage by submersible activity	Potential removal or disturbance of chimney segments, organisms or surrounding seafloor. Potential alterations of seafloor or subsoil. Accidental damage to chimneys or surrounding habitat. ROV tether can catch structures and damage them.	Undertake detailed site surveys to avoid disturbance of biological communities by drilling. Carefully navigate cores into well surveyed sites of sufficient sediment thickness for IODP-type drilling. Environmental Assessments may be used to identify possible impacts and potential mitigative measures, even if they are not required by law. "Doppler bottom lock" keeps ROVs from contacting venting structures, controlled navigation of instruments/vehicles above seafloor can minimise damage.

APPENDIX 7: Draft Endeavour Hydrothermal Vents MPA Scientific Research Review Form

Year: _____ Country: _____

Vessel Name: _____

Chief Scientist: _____

Location of research activity: _____

Dates of research activity: _____

Date plan was submitted to Oceans, Habitat and Enhancement branch: _____

I. Required Information

Does the submitted plan include:

a. Statement of purpose	Yes ☐	No ☐
b. Detailed description of activity & methods	Yes ☐	No ☐
c. Identification of vessels to be used and captain or pilot's name	Yes ☐	No ☐
d. Period and duration of activity	Yes ☐	No ☐
e. Location of activity (latitude and longitude)	Yes ☐	No ☐
f. Information on how impacts will be minimised	Yes ☐	No ☐
g. List of licenses, permits, consent etc. obtained for this activity	Yes ☐	No ☐
h. Name, address and telephone number of contact person	Yes ☐	No ☐

II. Endeavour MPA Regulations

Is the proposed activity a form of scientific research/monitoring? Yes ☐ No ☐

1. Will this activity contribute to meeting the management and conservation objectives of EHV MPA, including:

a. Managing the Endeavour MPA	Yes ☐	No ☐
b. Monitoring the effectiveness of the conservation objectives	Yes ☐	No ☐
c. Investigating incidents that may have an environmental impact	Yes ☐	No ☐
d. Improving understanding of the system	Yes ☐	No ☐
e. Other purposes (describe below)	Yes ☐	No ☐

_____

_____

III. Evaluation of the Plan

1. Are the proposed activities compatible/coordinated with other research activities in the area? Yes ☐ No ☐
2. Has this or a similar plan been submitted in previous years Yes ☐ No ☐
   a. Is this a recurring or annual project? Yes ☐ No ☐
3. Are the studies designed with attention to the Code of Conduct? Yes ☐ No ☐
4. The activity will be conducted in the following management areas Yes ☐ No ☐
   a. Main and/or Mothra Yes ☐ No ☐
   b. Salty Dawg Yes ☐ No ☐
   c. High Rise Yes ☐ No ☐
   d. Other vent fields (name) Yes ☐ No ☐
   e. Rift Valley (describe) Yes ☐ No ☐
   f. Other (describe) Yes ☐ No ☐
5. Primary species/habitat activity is directed toward Yes ☐ No ☐
   Pelagic species Yes ☐ No ☐
   Benthic species Yes ☐ No ☐
   Species at risk Yes ☐ No ☐
   Benthic habitat Yes ☐ No ☐
   Vent fluids Yes ☐ No ☐
   Water chemistry Yes ☐ No ☐
   Geological Yes ☐ No ☐
   Oceanographic Yes ☐ No ☐
   Other (specify) Yes ☐ No ☐
6. Will samples be collected? Yes ☐ No ☐
   Sediment Yes ☐ No ☐
   Vent Fluid Yes ☐ No ☐
   Benthic sedentary organisms (clams, tubeworms) Yes ☐ No ☐
   Pelagic invertebrates Yes ☐ No ☐
   Pelagic vertebrates Yes ☐ No ☐
   Zooplankton Yes ☐ No ☐
   Other (describe) Yes ☐ No ☐
7. Has the sample collection form been completed? Yes ☐ No ☐
8. Has the proposal been screened through the Research Activity Review Framework? Yes ☐ No ☐
9. What is the overall impact based on the RARF?
   High Yes ☐ No ☐
   Medium Yes ☐ No ☐
   Low Yes ☐ No ☐
10. What species and habitat will the activity impact?

11. What are the potential stressors?

12. Does the assessment demonstrate that the activity meets the regulatory conditions? Yes ☐ No ☐
13. Are there any additional circumstances to be considered? (describe) Yes ☐ No ☐

Comments:

_____

_____

_____

_____

(To be completed by MPA manager)

Recommended for consent:

☐ YES
☐ NO
☐ Further guidance (below)

Further guidance:

Signature: _____ Date: _____
MPA Manager, OHEB

APPENDIX 8: InterRidge Statement of Commitment to Responsible Research Practices at Deep-Sea Hydrothermal Vents

RESPONSIBLE RESEARCH PRACTICES:

As members of an international research community we encourage all scientists to abide by the following guidelines:

1) Avoid, in the conduct of scientific research, activities that will have deleterious impacts on the sustainability of populations of hydrothermal vent organisms.

2) Avoid, in the conduct of scientific research, activities that lead to long lasting and significant alteration and/or visual degradation of vent sites.

3) Avoid collections that are not essential to the conduct of scientific research.

4) Avoid, in the conduct of scientific research, transplanting biota or geological material between sites.

5) Familiarize yourself with the status of current and planned research in an area and avoid activities that will compromise experiments or observations of other researchers. Assure that your own research activities and plans are known to the rest of the international research community through InterRidge and other public domain data bases

6) Facilitate the fullest possible use of all biological, chemical and geological samples collected through collaborations and cooperation amongst the global community of scientists.

We also reaffirm our commitment to open international sharing of data, ideas and samples in order to avoid unnecessary re-sampling and impact on hydrothermal vents, and to further our global understanding of these habitats for the good of all people on Earth.

Fisheries and Oceans Canada | Pêches et Océans Canada

ACCIDENTS AND MARINE ENVIRONMENTAL EMERGENCIES
Canadian Coast Guard Regional Operations Centre
Tel: 1-800-567-5111

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